The Journal

OF THE

AMERICAN DENTAL ASSOCIATION

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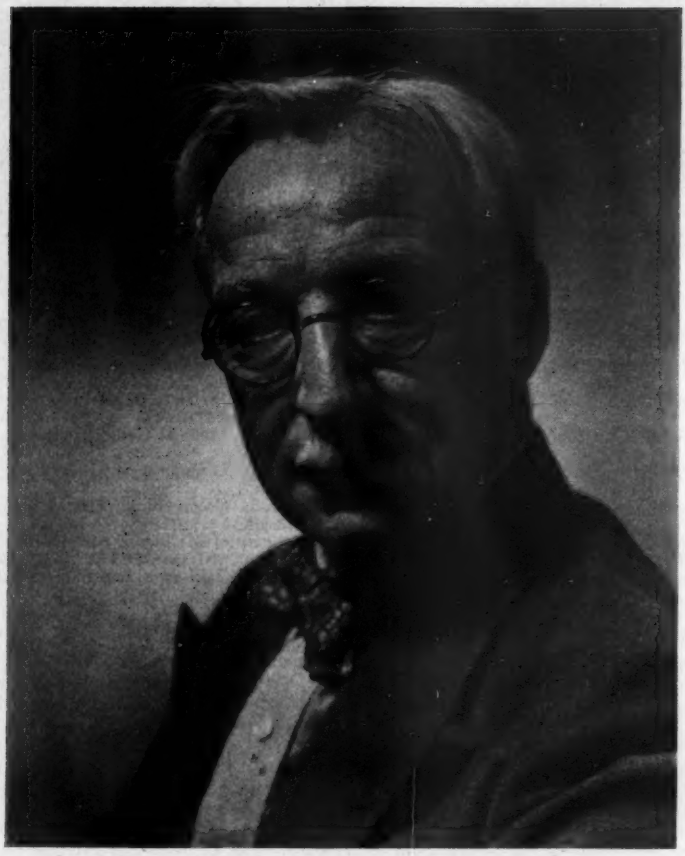

FRED R. ADAMS, D.D.S., New York, N. Y.
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ENDOCRINE DRUGS AND METABOLISM

JOHN C. KRANTZ, JR.,* M.D., Baltimore, Md.

OCCUPYING positions of preeminence in the pharmacopeias of the world today are the drugs of endocrine origin. Needless to say, these drugs have displaced the old-time elixir, fluid extract and pill that represented the era of so-called polypharmacy. Further, one can say that the addition of these endocrine products to the armamentarium of the physician and dentist represents an achievement on the part of the organic chemist, the biochemist and the pharmacologist.

We are particularly concerned with the effect of endocrine therapy on metabolism, in its broadest sense those chemical changes in the body that convert food substances into the complex constituents of cells and tissues, and, on the other hand, reduce food substances to lower energy levels for the production of heat and energy by the animal organism.

THE SUPRARENALS

This story begins with the coming of John J. Abel to Baltimore to become the first professor of pharmacology in the Johns Hopkins Medical School. Abel had read that two investigators, Oliver and Schaffer, had succeeded in isolating from the suprarenal glands an extract the injection of which into laboratory animals would give rise to an increase in the blood pressure. Long and hard he worked on the problem of trying to separate from this crude extract that substance which, when injected into laboratory animals, was responsible for the pressor activity. Just before the turn of the century, Abel succeeded in getting an active benzoyl derivative of adrenalin from the suprarenal glands. It was at that time that Takamine, the Japanese physiologist, visited Abel's laboratory. Later, he carried out some of Abel's experimental procedures in the city of Detroit and, in the laboratory of Parke, Davis and Co., further purified the extract that yields the pure crystalline adrenalin, the first hormone to be isolated from the glands of internal secretion.

It is interesting to note and of more than passing importance that, three years

*Professor of pharmacology, University of Maryland, School of Medicine.

later, in 1904, the German chemist Stoltz succeeded in synthesizing this important hormone.

The injection of adrenalin stimulates the sympathetic division of the autonomic nervous system and meets with a multiplicity of responses, foremost among which are a rise in blood pressure and constriction of the arterioles, particularly in the periphery, a reaction which the dentist recognizes in localizing the anesthesia from all anesthetics with the exception of cocaine, which itself possesses this sympathetic action and characteristic of adrenalin, the bronchioles and intestine being relaxed, and stimulation of the pilomotor nerves giving rise to the erection of hairs. The body is set for an emergency, but what about metabolism?

The metabolism of the fasting white rat is roughly 95 per cent fat metabolism. If small doses of this active hormone are injected into the rat, the fat consumption is accelerated 30 per cent, an indication that adrenalin acts to increase the metabolism not only of carbohydrates, but also of fat.

It is well known that the sympathetic fiber which goes to the liver is glycogenolytic in character and that the liver polymerizes glucose from the blood and stores it in the form of glycogen, and then converts the glycogen into glucose as the body needs it. In man as well as in laboratory animals, when adrenalin is injected, there is a transient hyperglycemia. The mechanism of this hyperglycemia is twofold: glycogen is mobilized and sugar is poured into the circulation from the liver; secondly, in the periphery, the vessels are constricted and there is a diminution of the utilization of sugar in the periphery, which gives rise to an increase in the blood-sugar level and, in certain very susceptible individuals, even a transient glycosuria.

Such drugs as ephedrine and neosynephrin, which act to elicit this same vasoconstrictor action of epinephrine, do not, to the same degree, act to increase the blood sugar.

THE THYROID

In the year 1891, Murray, of London, made a glycerin extract of the thyroid gland of animals and gave it to a woman who had myxedema. This woman lived twenty-eight years after the treatment was instituted, dying sometime during the early part of the twentieth century, not of hypothyroidism, but of heart disease. In the early days, the investigators of thyroid gland conditions were fully cognizant of the fact that those glands that are rich in iodine are potent in increasing the basal metabolic rates of individuals who ingest them. This was observed by Bauman in 1895, yet there was no explanation of this observation, which showed a close relationship between the iodine content of the gland and its action in increasing the basal metabolic rate. In 1916, Kendall, of the Mayo Clinic, solved this problem. He isolated from the thyroid gland of sheep an active principle thyroxin. He showed that the thyroxin molecule contained iodine and that the activity of the gland was dependent on the iodine content simply because the iodine content of the thyroid gland was a measure of its thyroxin content.

In 1927, Harrington, of England, achieved a great success in making thyroxin without a thyroid gland. He synthesized this compound in the laboratory and it was proved to be identical with natural thyroxin.

It has been found that, after thyroidectomy, the basal metabolism of the dog drops to 60 per cent of its normal value, an indication that 40 per cent of the oxygen intake of the body is dependent on the integrity of the thyroid gland and its hormone, thyroxin. What will this do in man?

In the congenital hypothyroidism known as cretinism, called by Paracelsus a toadlike caricature of humanity,

wherein one has an imbecile expression, a coarse skin like that of a toad, a dulness in intellect and mental apathy, the feeding of thyroid gland two or three times a day causes a dramatic change, so remarkable that Osler, the famous physician of Johns Hopkins University, remarked, "Never did the magic wand of Prospero or the brave kiss of the daughter of Hippocrates ever bring about such a profound change as the feeding to the cretin of thyroid three times a day." Expressed a little less poetically, but perhaps more scientifically was the remark made by Kendall, of the Mayo Clinic: "Thyroid provides to every cell of the body that mechanism which gives it its greatest amount of flexibility in carrying on its vital processes."

We know that there are many people who ingest thyroid, some without medical advice. It is unfortunate that in this country many people try to rid themselves of excess body weight by taking materials of this kind. To be sure, it speeds up metabolism and, along with other activity, will reduce body weight.

THE PANCREAS

Regarding carbohydrate metabolism, P. A. Levin, late chemist of the Rockefeller Institute, said: "The most important phenomenon on this planet is the utilization of sugar by brain cells." It *is* the most important phenomenon on the planet, for when it stops, everything stops.

Some one has added to this trenchant remark the statement that, from the properly guided oxidation of sugar by brain cells, came a "Hallelujah" by Handel, an "Origin of the Species" by Darwin and an "Emancipation Proclamation" by Lincoln.

The story of carbohydrate metabolism goes back to the memorable year 1776. Here are some of the interesting events which took place in that year: Adam Smith wrote the immortal "Wealth of Nations." Joseph Priestley, discoverer of oxygen, made the laughing gas that the great Horace Wells later put to use as an anesthetic. Percival Potts discovered that the impinging of coal tar on the scrotum of chimney sweeps gave rise to carcinoma. We now know that coal tar contains a carcinogenic hydrocarbon. Dobson demonstrated that the sweetness of the urine of the diabetic was due to the presence of sugar.

Almost a century passed and a brilliant European clinician, Naunyn, stood one afternoon in one of the wings at the University of Strassburg and, in that contemplative mood so characteristic of poets and scientists, looked down into the courtyard of the school and observed two groups of dogs. On the excreta of one of these groups, there were flies. On that of the other group of dogs, this condition did not obtain. Naunyn was a true scientist, an individual who had the simplicity to wonder, the ability to question, the power to generalize and the capacity to apply. He was curious about it. He went to the professor of physiology and asked him in what respect the one group of dogs were different from the other. "I depancreatized that one group of dogs," was the reply. And through the scintillating intellect of Naunyn flashed the idea of locating the site of diabetes mellitus. He depancreatized laboratory animals and produced the cardinal symptoms of diabetes mellitus in these animals. His experiments showed that the site of diabetes was the pancreas. Prior to that time, the bladder, the liver and the kidney had all been incriminated. And now ideas came with a great rush: "If the pancreas is responsible for the combustion of sugar, there must be a principle present which we can take out and inject into the diet and cure or alleviate diabetes."

Time went on, decades passed. Many people tried and all who tried failed.

In the year 1920, Frederick Banting had returned from World War I. He had seen service at Cambrai and Salonika

and had gone to London, Ontario, to start a medical practice. One evening, he read in the *Journal of Surgery, Gynecology and Obstetrics* that, very frequently, concretions occurring in the common duct, and which have started in the gallbladder, in blocking the pancreatic secretion will cause degenerative changes in the pancreas. That brought an idea to Banting. He could not sleep that night. The next day, he went to the laboratory of Professor Macleod and said: "I have an idea that insulin can be extracted from the pancreas in the active form." Macleod was skeptical. "So have other people," he said. "You are not a biochemist." That did not cause Banting to whimper. "Give me a chance," he replied and he asked for the help of a second-year medical student. Macleod answered, "Take one of these two young men," and as far as names went, there was no choice, for one was named Nobel and the other was named Best—a flip of a coin made the name of Best immortal in the world of science and brought him, with Banting, the Nobel prize.

Hard months of works were ahead. They depancreatized dogs and they ligated the pancreatic duct which offered obstruction, and when the acinous tissue had degenerated, from the islet tissue they were able to extract insulin in a pure and active form. It so happens that the trypsin of the pancreas causes the destruction of insulin and that was the pitfall which all of the other investigators had fallen into. Trypsin had destroyed the insulin that they were extracting from the pancreas. In fetal calves, the islet tissue develops in the pancreas before the zymogenous tissue; so Banting and Best went to the abattoir and obtained the pancreases from fetal calves and made extracts of these organs active in insulin. There was no acinous secretion present. Then they undertook another series of physical experiments. They injected secretin until the pancreatic enzyme secretion was exhausted, and just as soon as this was exhausted, the tissue was extracted. Now from that pancreas, they could extract the active insulin. Furthermore, they resorted to use of certain fish in which, particularly in the toadfish, the zymogenous tissues and the islet tissues are separate one from another. From the rest of the islet tissue on the mesentery of these fish, Banting and Best extracted insulin in an active form. That meant life for those diabetics who were about to die. It snatched some from the brink of the grave, and we have gone on twenty years with insulin as one of our greatest weapons in the fight against diabetes.

What have we done about it in all these years? Some one will say, "My patients ask me, 'Doctor, why can't I take insulin by mouth?'" There is an answer and a scientific answer. We have experimented. We have put insulin into an enteric coat so that the trypsin of the pancreas could not split this molecule of insulin. Insulin is not absorbed from the alimentary tract. It has a high molecular weight, 35,000. Bolman and Mann, at the Mayo Clinic, demonstrated that. They exteriorized the intestinal tract of a dog and painted insulin on the intestinal mucosa. They checked the blood sugar five minutes later, ten minutes later, a half hour later. Nothing happened. They took the same amount of insulin and injected it through the mucosa into the muscular coat. Precipitously, the blood sugar went down, its decrease indicating in an almost prophetic manner that insulin is not absorbed out of the alimentary tract and our hope for an oral preparation is not very bright. Professor Hagedorn of Denmark succeeded in mixing insulin with protamine and a small amount of zinc salt. Protamine is a protein-like substance of low molecular weight obtained from spawning salmon, and when insulin is mixed with it, it becomes the commercial protamine zinc insulin. This material, when injected into man, prolongs the hypoglycemia of

insulin for two reasons: First it is neutral, pH 7. Ordinary insulin is rather acid, pH 3. The acid insulin is carried away rapidly from the site of injection. The neutral insulin is only slowly carried away from the site of injection. Thus, by the addition of this protein molecule protamine to the insulin, the compound is slowly liberated into the body tissues much, we believe, as it is elaborated by the islet tissue of the pancreas itself.

Crystalline insulin was isolated first in 1926, by Professor Abel. This substance is now being torn down part by part, in the hope that some day we shall be able to synthesize this hormone or perhaps, even better, synthesize a simpler molecule that might be active by mouth in promoting this greatest of human processes, the oxidation of sugar in the body.

THE PITUITARY

It has been known for a long time that the posterior lobe of the pituitary gland elaborates two principles, which are available as therapeutic agents. One of them, pitressin, raises the blood pressure and, in addition, plays an important part in water metabolism. In the discomforting disease diabetes insipidus, this substance will act to control the urinary output; which shows that the pituitary, at least through one of its principles, has an important rôle in the metabolism of water in the body. The other principle elaborated by the posterior lobe of the pituitary gland, oxytocin, which acts upon the smooth musculature of the uterus, is used in obstetrics to reduce postpartum hemorrhage and, in the armamentarium of the obstetrician, is one of the foremost drugs.

We have known for many years that those who suffer with acromegaly, a form of hyperpituitarism, are also recalcitrant to insulin. Large doses of insulin produce no striking hypoglycemia and now we have the answer to the problem. Professor Houssay, of the Argentine Republic, about five years ago described removal of the pituitary gland and the pancreas from large tropical frogs. Then he carried out the same experiment in dogs, both hypophysectomized and depancreatized. The depancreatized dog has a high blood sugar. Coma, with death, is the prognosis. But without the hypophysis, the blood sugar remains at virtually a normal level. Furthermore, it has been shown that the pituitary gland elaborates a principle which is diabetogenic in character and actually antagonizes the internal secretion of the pancreas.

I think it is fitting to say that the pituitary gland is the interlocking directorate of the endocrines, and although from the posterior lobe of the pituitary gland we have obtained at least two principles, from the anterior lobe we have literally a host of principles. The injection of extract of the anterior lobe seems to cause rapidity of growth when the epiphyses of the long bones are not in contact. The anterior lobe acts to elaborate the universal sex hormone, the stimulator of the gonads in both male and female, and also a principle which stimulates the thyroid hormone. The thyroid is not active when the anterior lobe of the pituitary has been extirpated. Also, there is in the pituitary gland a lactogenic hormone, an adrenogenic hormone and an adrenal cortex stimulator. Therefore, the anterior lobe of the pituitary, situated as it is at the head of the body with its arms reaching out to all of the other glands of internal secretion, exercises control over them in the form of an interlocking directorate for the physiologic well-being of the individual.

Enough has been said, I think, to illustrate what Lewellys F. Barker said many years ago: "We are the victims or the beneficiaries of our glands of internal secretion."

NEGATIVE PRESSURE IMPRESSIONS FOR FULL DENTURES

HARRY E. DENEN,* D.D.S. (DC), Chicago, Ill.

IT has been the desire of the dental profession for many years to standardize, to a certain extent, impression technics for full dentures. Because of the many and varied conditions presented in an edentulous mouth, this seemed almost impossible. The myriad methods, theories, gadgets and, of course, different types of impression materials that have been suggested have lent much to the confusion relative to the merits of the many technics now at hand.

The ideal impression, we are all agreed, is one embracing all the edentulous area that is to be utilized by the dentures, embodying a composite of the tissues at rest without any overcompression or displacement. Such an impression taken with negative pressure will insure a positive adaptation of a denture.

Since my entry into the service, it has been my good fortune to be attached to a prosthetic activity. I have had the opportunity of seeing almost every type of edentulous mouth that would be encountered in a lifetime in a normal dental practice, from the "green mouth" of a recent extraction to the mouth with ridges conspicuous by their absence.

The Medical Corps of the Navy has a mission in which we of the Dental Corps ardently try to help: "To keep as many men at as many guns as many days as possible." To this end, we try to send men back to duty as quickly as possible, comfortable and efficient. Because of the ever-increasing amount of denture work necessary, it became obvious that a technic for taking impressions for full dentures must not take up too much chair-time and must still produce a well-fitting denture. No complicated or involved procedure should be employed to take these impressions. Ordinary elementary prosthetic procedure is all that should be necessary, and it should be applicable to any type mouth under any conditions.

Many years ago, when evolving an immediate denture technic, in utilizing a hydrocolloid to complete the impression, I noted that, with such a material, it was possible to obtain a very fine impression and the resultant fit of the denture was excellent. The accuracy of this material was, in a measure, equal to that of plaster of Paris, without the latter's attendant disadvantages. It also had the attribute of soft flowing wax in that positive pressure was not necessary to induce flow of the material. This quality, combined with its property of elasticity, when set, gave us a material that was nearest the ideal. Because of the necessity of heating the material and introducing it into the mouth while warm and then chilling, definite disadvantages of using it for the impressions of edentulous mouths were recognized. The necessity of confining this material in a suitable tray for chilling purposes made its uniform use impossible. Consequently, inevitable chances for error entered into the use of the hydrocolloids for full denture procedures.

With the advent of the war, agar, the important ingredient in the hydrocolloids, became unobtainable. A new colloid was presented to the profession

*U. S. Naval Hospital, Corpus Christi, Texas.

that is just as good and, in some respects, far better. This material consists of an alginate base in powder form. When it is mixed with water, a thick creamy impression material results which, when set by chemical reaction, produces a very tough impression and one that cannot be distorted on removal from the mouth. Because of its ease of manipulation and simplicity of use in any type of mouth, it has made possible the taking of good impressions in shorter time than it takes to explain the technic.

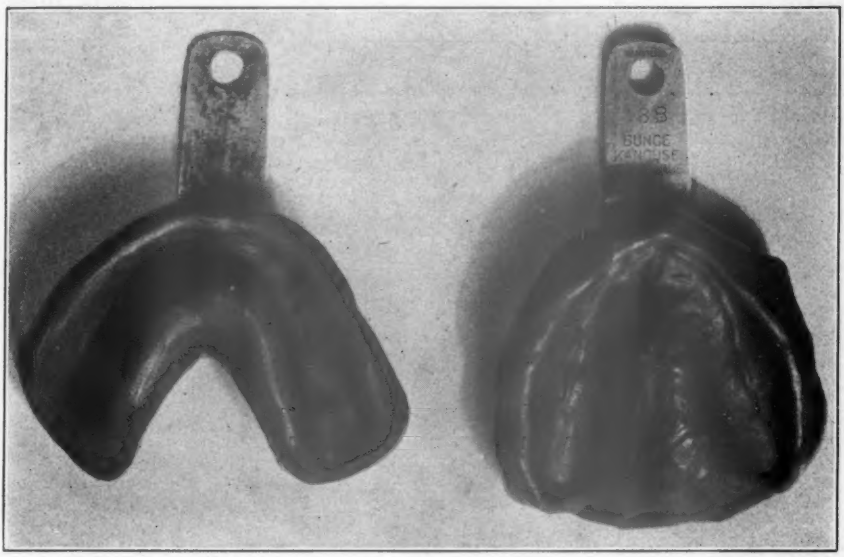

Fig. 1.—Guiding impression (upper and lower) of surfaces of ridge areas.

No impression material offers the answer to the impression problem, but, with a precise technic, this material comes closest to the combined qualities of plaster, modeling compound, the impression waxes and the various impression pastes. First, it equals plaster in its accuracy of reproduction of tissue detail. Second, it rivals compound, the waxes and the pastes with its property of flow and moldability. It has the advantage over plaster in that it is easier to manipulate, has elasticity and is more pleasing to the patient. Its elasticity allows the material to flow, to be confined in inaccessible areas and to be withdrawn when set, without distortion of the impression or disturbance to the patient upon its removal. Last and most important of its attributes, impressions are taken with the tissues at rest, without due compression or displacement of the tissues. Such an impression is taken with negative pressure and insures an adaptation fit of the denture.

TECHNIC

An ordinary suitable edentulous tray is selected. Modeling compound impressions are taken covering full maxillary and mandibular areas. In taking these impressions, the first step is to merely seat the soft heated compound without any pressure and to immediately remove from the mouth. This will give us a guiding impression of the surface of the ridge areas. (Fig. 1.) This tray is then chilled on the back surface with

cold water. With an alcohol torch, the inner ridge area inside the peripheral border is heated, waved in the air a couple of times for tempering and reseated in the mouth with positive pressure. It is then removed and the under surface chilled, and the process is repeated until a well-adapted and well-outlined impression is obtained. (Fig. 2.)

You will note that no chilling is done in the mouth. I have found the above-mentioned procedure more desirable and more accurate. Chilling the back surface of the tray originally prevents the compound from crawling out of control when pressure is applied and there will be less tendency to distortion on removal from the mouth.

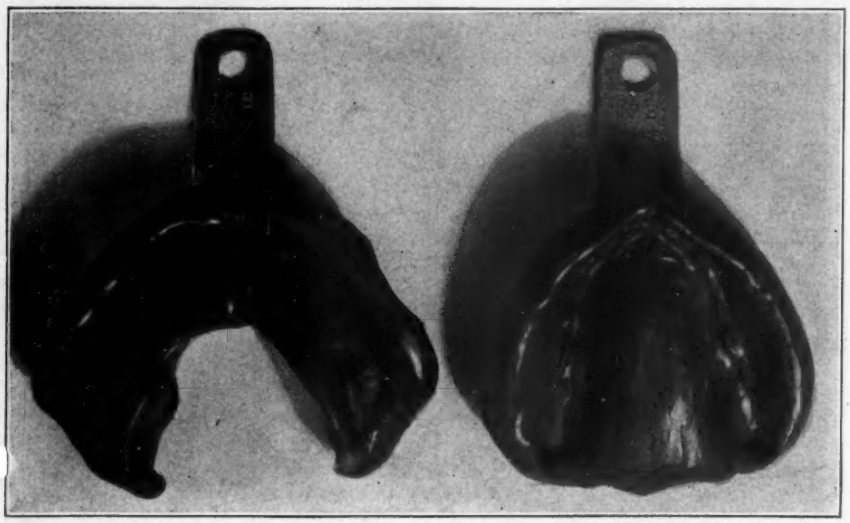

Fig. 2.—Finished primary impressions.

These impressions are made in plaster, and shellac baseplates are adapted to the models. (Fig. 3.) These baseplates are tried in the mouth and trimmed, in the upper jaw, to the flexure line of the mucobuccal fold and to the posterior border of the palate. The palatal border is determined by locating the sphenopalatine notch on each side with a blunt instrument and connecting these notches with a line drawn across the palate with an indelible pencil. The baseplate is trimmed to this line.

In the lower jaw, the baseplate is trimmed to the flexure line of the mucobuccal fold and to the lingual border until the baseplate cannot be dislodged when the tongue is out of the mouth. With the forefinger of each hand resting on the back of the baseplate, the patient is asked to protrude the tongue. As the tongue is protruded, finger pressure on one side is lifted and the baseplate is trimmed until there is no lifting of the baseplate by the tongue. This procedure is repeated on the opposite side.

Two more baseplates are now adapted on top of the first. The last two are luted together and trimmed to the border of the first. This will give a heavy tray with a precisely defined peripheral border. This tray will be oversize the thickness of the first baseplate, which will allow for the reception of the colloid impression material for the final impres-

sion. Holes are drilled through the tray with a bur, for retention of the colloid. The holes must not be any larger than the approximate diameter of a No. 560 cross-cut fissure bur and care should be taken to see that the holes are made close to the edge of the border to prevent the colloid from becoming disengaged.

These holes in the trays also help perform the most important duty of the technic. The premise upon which this procedure has been established is that a composite of the edentulous areas at rest is desirable and this can be obtained only by exerting negative pressure in taking the impression. As the tray with the semisoft colloid is wriggled to place, any pressure created is immediately dissipated as the material escapes through the holes. Tissues are then at rest without being compressed or distorted, and the easy flow and moldability of the material with its subsequent elastic property when set creates a perfect impression of these tissues in their true state.

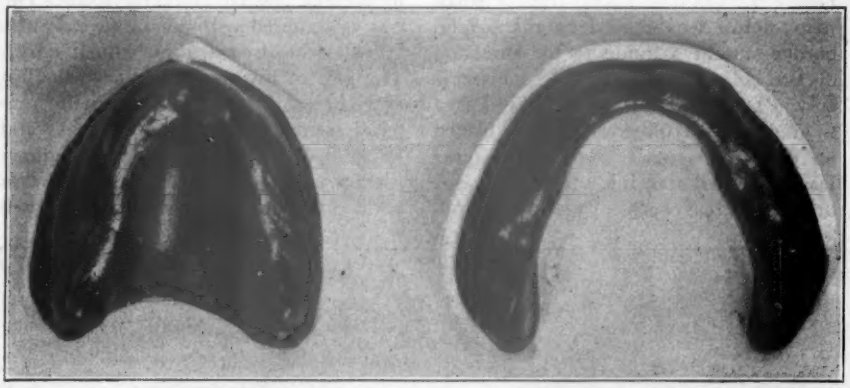

Fig. 3.—Models with shellacked baseplates adapted.

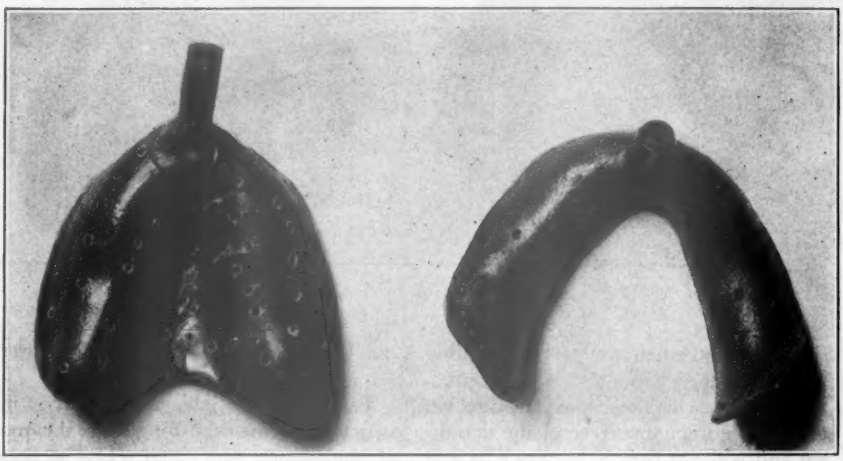

Fig. 4.—Trays with compound handles luted.

Small compound handles are luted with dry heat to the trays. These need not be large. Wet compound should not be placed on the surface of the tray as it will not adhere. When these impressions are taken, they can be removed only with the handles, as shown in Figure 4. On the upper tray, a small strip of soft wax placed on the palatal border acts as a guide to the direction of the colloid, and thus the inevitable crawl of the material in the palatal area is prevented. Utility wax is also placed on the distolingual border of the lower tray. This directs the material to the undercut areas back of the mylohyoid ridge so that when the tongue is lifted to the palate, when the tray is inserted, the colloid will flow and be directed toward the lingual surface of the mandible and will not have a tendency to thin out when the tongue is returned to the rest position. (Fig. 5.) The character of this wax does not displace or compress tissue because it is very soft and pliable, and only a very small amount is necessary to act as a guide.

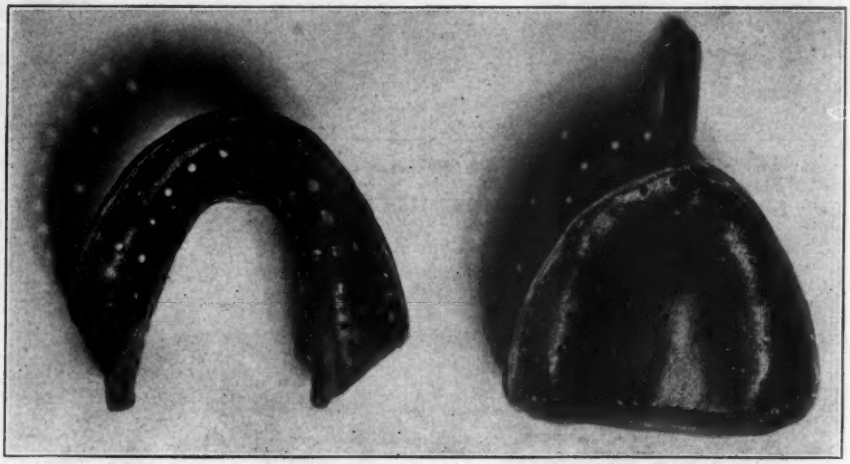

Fig. 5.—Surface views of trays shown in Figure 4.

The colloid is then mixed according to the manufacturer's instructions. The material is engaged in the holes of the tray first; then the tray is filled. In the upper jaw, with the thumb and forefinger holding the tray handle and the middle finger balancing the tray in the palate, the tray is placed in the mouth with a slight wriggling motion. This is to prevent possible trapping of air. The tray is centered without undue pressure. It will seat itself without much effort. The patient is cautioned to keep the lips and cheeks totally relaxed. As the material begins to congeal, the cheeks and upper lip are patted gently. This allows the lip and cheeks to drape themselves with ease and muscle attachments will cut their own paths without any interference.

For the lower jaw, the patient is instructed to raise the tongue to the roof of the mouth when told. This is done as soon as the tray is introduced into the mouth. As soon as the tray has been wriggled to place, the patient is instructed to drop the tongue to its rest position. The forefinger of each hand is placed on the crest surface of the tray and, as the material congeals, the cheeks and lip are patted gently and the patient

is asked to slowly protrude the tongue until he can touch the lower lip and then relax into the rest position until the material has set. An extra minute is allowed for the setting of the lower impression.

To release the impression in the upper, the cheeks are distended and the handle of the tray is pressed firmly down. If release is difficult, the patient is instructed to close the lips and blow until the impression is released. In the lower jaw, the tongue must be in its rest position and then the cheeks are distended. The tray is lifted up by the handle, pushed slightly backward toward the throat and then lifted out. (Fig. 6.)

The impressions are washed thoroughly in cold running water for at least ten minutes. This is important as the viscous character of the saliva has a tendency to adhere to the surface of the impression and will interfere with the proper setting of the surface of the stone model and this surface may consequently be rough and pitted. If this precaution is taken, the finished models will be as smooth as glass. It has been my experience that failure in the use of the alginates for impressions has been the result of this neglect to thoroughly wash all saliva from the impression. These im-

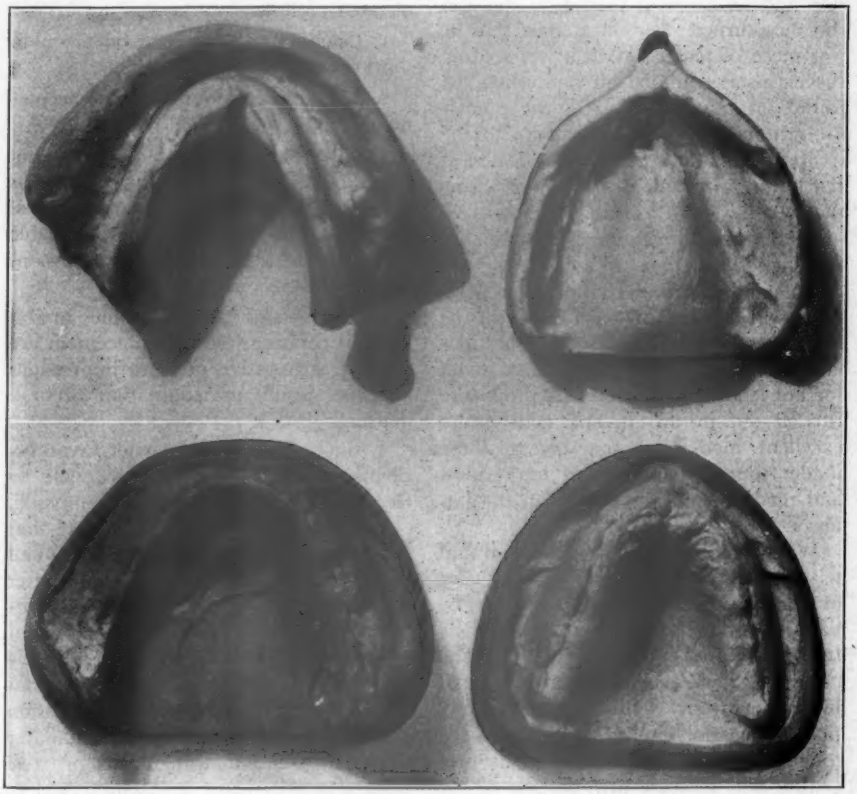

Fig. 6.—Finished impressions and models.

pressions are run as quickly as possible. No colloidal material should be allowed to lie around for any length of time before the models are made.

In making the models from this type of impression, care must be exercised in handling the impressions. Excess material is trimmed off with a razor blade or a very sharp knife. A thick mix of stone is vibrated into the upper impression and an excess is placed on top and the mix turned over on a glass slab or wet piece of paper. With a wet spatula the excess is trimmed off and when the initial set has taken place, the models are trimmed with a sharp knife to the desired form. This process is repeated in the lower jaw, with care to build a surplus at the heels, so that in that region the model cannot be broken in flasking. The stone is not allowed to completely set before trimming, as trimming will be difficult, particularly in the lower model. When all trimming has been done, the model is allowed to set for not less than one hour. A procedure carried out in this manner will insure excellent models, comparable to those made from carefully boxed impressions and made in quicker time than the latter.

When the dentures are completed and tried in the mouth, further refinement of the peripheral borders is made by painting the borders with extra low fusing wax or some indicator paste. The patient is then allowed to sit for about fifteen or twenty minutes with instructions to occasionally wet the lips with the tongue and pucker the lips. This procedure will indicate any portion of the border that may be overextended. The tissues that are impinged upon will cut through the soft wax or indicator paste. Ice water is then sprayed in the mouth and the material is chilled thoroughly. All places where the tissue has cut through the corrective material are trimmed with a stone or vulcanite bur, this process being repeated until all corrections have been made. The extra time taken in this step pays dividends, because it precludes the occurrence of sore spots from overextended borders.

SUMMARY

The distinct advantages of this technic are as follows:

1. Good impressions can be taken in short operating time.

2. All types of mouths can be accommodated.

3. The consistency of the material used to complete the impressions has been found to be the most nearly ideal in that it characterizes the most desirable qualities for the taking of impressions of edentulous mouths.

4. Impressions taken of tissues at rest without compression or displacement are defined as negative pressure impressions and will insure an adaptation fit of a denture.

5. Such dentures will react favorably physiologically, because tissues will be free and their circulation unhampered.

In conclusion, may I again state that no impression material is an answer to all our denture problems, and no matter what materials are used, none has discriminating power, and it can only be of value as it is intelligently and skilfully worked. A scheme of procedure that meets the prosthetic ideal of impression taking without involving any singular personal equation will insure progress toward standardizing a technic. Add to this an ability to establish a good working occlusion combined with a reasonable sense of esthetic values and the construction of dentures becomes a distinct pleasure, both for the operator and for the patient.

THE FRICTION OF REVOLVING STEEL BURS

CHESTER J. HENSCHEL. D.D.S., New York, N. Y.

APPLY a continuous steel lightning strip with blades like a cross-cut fissure bur against vital dentin and pull it across this sensitive tissue at the rate of twenty-five feet per minute—dry! One would not do this because of obvious frictional trauma, yet this visualizes just about what happens when the average dentist uses a No. 558 cross-cut steel fissure bur at 2,000 revolutions per minute or second speed. It is the purpose of this paper to indicate that the friction developed by steel burs is appreciable and dangerous, and persists even during gentle operating with the smallest burs.

Dental students are taught that steel burs are best used in the dry state, that dry burs cut faster and more painlessly than wet ones. The precise truth is the exact opposite, because, in the wet field, frictional heat is negligible. However, a continuous fine stream of warm water must be directed on the bur to absorb heat and clear away débris—it should not merely be moist.

Our graduate group* practices "thermal control" in all operative dentistry. By completely stabilizing the temperature of both dentin and revolving instruments, we prevent more than half the usual pain from treatment, and the speed of cavity preparation is increased considerably. Previous work on the thermal control of medicinals established a temperature tolerance zone from 85 to 130° F. for average vital dentin.[1] Since we find that thermal control minimizes pain during the use of even the smallest steel burs, it may be clinically shown that even these generate heat in excess of the upper tolerance zone limit of 130° F.

Friction, as developed by steel burs, was then experimentally measured, and it was found that the surface temperature of the dentin rose from its oral level of 98.6 to about 233 or even to 368° F., if 4 pounds pressure was used at 2,000 revolutions per minute (second speed). Jeserich,[2] Bronner[3] and Bodecker[4] recognized the clinical dangers of frictional heat, but did not discover appreciable heat in experiments with the gentle use of small steel burs.

This is understandable because, in measuring the increase in enamel, dentin or pulp temperature during operative procedures, the usual method is to insert a thermocouple into the pulp chamber or tooth substance and to "drill" or grind within a short distance of the measuring instrument. The recordings made in this manner were destined to be inadequate because dentin and enamel are good thermal insulators.[2] This property checks the penetration of frictional heat into the tooth and confines it largely to the thin layer of dentin in contact with the bur.

Most of this heat energy escapes along paths that offer less resistance than tooth structure—into adjacent moisture and air, and into the bur or grinding instrument itself, in all three planes—least of all in the direction of the conventionally placed thermocouple. However, it must be pointed out that before this frictional heat is dissipated, it is focused upon a small surface area of exposed dentin. Why the thermocouple gave only a limited indication of the friction from a steel bur is therefore evident.

*Leon Lieber, D.M.D.; Morris Gudwin, D.M.D.; Jack R. Kopely, D.D.S., and Chester J. Henschel, D.D.S.

Earlier work was concerned with pulp trauma, with the gross rise in temperature of tooth substance during cavity preparation, but when the prevention of pain is considered, the problem is to measure the quantity of thermal energy focused or impacted upon the surface of the cut open ends of dentin tubules in actual physical contact with the bur. Since the dental pulp and vital unmetamorphosed dentin are especially sensitive to temperature changes,[5] the concentration of a few calories, as from small burs, on a small area of dentin fibrils, is felt as pain. It would seem that the surface dentin is burned in much the same way that the skin of one's hand would be burned by a small hot instrument without appreciable increase in the temperature of the entire hand. It is probable that the actual temperature changes that cause dental pain are more subtle and delicate than has heretofore been realized. The pain is not felt in the pulp, but in the small area of bur contact where the temperature rise produces pain, much the same as an explorer on vital dentin at its point of contact. Therefore, it is here that the temperature rise should be studied, not in the pulp.

The successful plan measured the total caloric production of heat energy by the revolving instruments at normal operating speeds and pressure. This permitted the calculation of the actual cut dentin surface temperature and that of the steel blades of the bur, using their respective weight, density and specific heat. The effect of any one portion of this caloric energy is necessarily momentary; but since its generation is continual, it persists as the bur revolves. Such heat may be indirectly measured by pouring a fluid over the frictional surface, noting the increase in temperature and using this figure in the calculation.

EXPERIMENT

Water was used as the optimum heat absorbent, at 8.0 cc. a minute. It was passed over the working area of the bur or stone in drilling or grinding a recently extracted tooth. The dental engine was used at second speed, about 2,000 revolutions per minute, and the operating pressure was recorded on a spring scale. The temperature of the flowing water before, during and after drilling or grinding was recorded to circumvent environmental influence. With the fluid stream, engine speed and pressure need not be limited, and thermal abuse is impossible. However, to simulate the conditions of ordinary skilful operative dental work, these experiments were conducted under conditions of normal operative restraint.

Thirty-three hundredths calorie per second (20 per minute) was generated by a new No. 558 steel bur at 4 pounds pressure and 2,000 revolutions per minute. A representative variety of burs, stones and disks were also tested, and the work of Jeserich was confirmed: the total friction was approximately proportionate to speed, pressure and size of the revolving instrument. However, it must not be assumed that small instruments are less abusive than large ones from the "thermal-pain" point of view. Final calculations indicated little difference between the No. 558 steel bur and either larger or smaller burs, whether the entire or only part of the bur was used, if our concern is, as it should be, heat impact per dentin tubule.

The formula for estimating the thermal rise from a revolving instrument on the surface dentin may be expressed as shown in Table 1.

Under the operating conditions of the experiment, the temperature rise may be considered as 270 degrees F. at the site of operation or actual working area, which when added to the mouth level of 98.6° F. yields 368.6° F.

The reasoning and calculations of this work are involved and wearisome and probably interest only the research en-

thusiast. For a more complete explanation of the method of temperature determination, it is suggested that the previously published paper be consulted.[8]

The experiment was continued, using an assortment of dental burs and stones, and, in the manner in which they are employed during actual cavity preparation, the amount of pressure exerted on each instrument was varied from 1 to 4 pounds, and in some tests using cylindrical burs, only half their length was used in cutting. The No. 558 steel bur may be considered representative:

No. 558 steel bur, 4 pounds pressure, 2,000 revolutions per minute. Full length used in cutting (3.8 mm.), heat generation: 20 calories per minute. Half length used in cutting (1.9 mm.), heat generation: 20 calories per minute.

No. 558 steel bur, 2 pounds pressure, 2,000 revolutions per minute. Full length used in cutting (3.8 mm.), heat generation: 10 calories per minute. Half length used in cutting (1.9 mm.), heat generation: 10 calories per minute.

No. 558 steel bur, 1 pound pressure, 2,000 revolutions per minute. Full length used in cutting (3.8 mm.), heat generation: 5 calories per minute. Half length used in cutting (1.9 mm.), heat generation: 5 calories per minute.

Although, in each of these three experiments, the caloric generation with the full or half bur remained identical, calculations using the formula indicated that the dentin got twice as hot when half the bur length was used, as shown in Table 2.

Further experiments with smaller burs all the way down to No. 33½ inverted cone and No. ½ round burs, which have about 0.5 square millimeter available cutting surface, gave limited caloric heat,

TABLE 1.

Formula:	Calories per second	$\times \frac{1{,}000}{0.5 \times \text{area dentin contacted in mm.}} \div$		Specific gravity of dentin	÷	Specific heat of dentin	=	Estimated centigrade rise
More simply:	c	$\times \frac{1{,}000}{\text{amount dentin heated}} \div$		S.G.	÷	S.H.	=	Degrees C.
Example:	0.33	$\times \frac{1{,}000}{3.5} \div$		2.1	÷	0.3	=	150 degrees C., or 270 degrees F.

TABLE 2.

Example: No. 558 steel bur, 2 pounds pressure, 2,000 revolutions per minute.
10 calories per minute = 0.167 calories per second.

A—Full bur length — 3.8 mm. = 7.0 sq. mm. frictional area.

$$0.167 \times \frac{1{,}000}{0.5 \times 7.0} \div 2.1 \div 0.3 = 75 \text{ degrees C.} = 135 \text{ degrees F. rise.}$$

B—Half bur length — 1.9 mm. = 3.5 sq. mm. frictional area.

$$0.167 \times \frac{1{,}000}{0.5 \times 3.5} \div 2.1 \div 0.3 = 150 \text{ degrees C., or 270 degrees F., rise.}$$

as could be expected, not because the smaller burs contact less dentin, but because the limited diameter of such burs reduced the dynamic frictional surface per minute and, in effect, their use is the same as slowing the dental engine. Despite this fact, calculation employing the small working frictional area of these burs disclosed that the heat impact per dentin tubule was similar to the results of the No. 558 bur recording. With the smallest burs, the caloric generation was only about one-fourteenth of that with the No. 558 bur, but the heat was impacted upon a proportionately smaller area; i.e., 1 :14 = 0.5 : 7.0.

DISCUSSION

The thermal rise under discussion is the product of the frictional contact applied to the heating of both dentin and steel, and that therefore each is less hot than the calculation would indicate. While this contention may be somewhat justified, other facts minimize the figures so much that error, if it exists, will probably be found on the conservative side. The caloric rise was measured by the only method suitable for this experiment —the temperature rise of a stream of water, which minimized the thermal rise by automatically cleaning and lubricating the bur during cutting. A dry or barely moist bur would have generated far more heat. The estimated temperature was also minimized by loss of heat from the experimental apparatus itself.

In addition, it is generally recognized that, given the same heat source, thin

TABLE 3.

$$c \times \frac{1{,}000}{\text{Weight of steel bur head in mg. (amount of steel heated)}} \div \text{S.G.} \div \text{S.H.} = \text{degrees C. rise.}$$

$$0.33 \times \frac{1{,}000}{20} \div 7.70 \div 0.107 = 20.0 \text{ degrees C., or } 36 \text{ degrees F., rise.}$$

between the steel blades of the bur and the living dentin, and another method or hypothesis of determination is possible. It may be considered that the bur gets hot and the heated steel blades contact sensitive dentin fibrils and cause pain. The head of a No. 558 bur weighs about 0.02 gm. and has a specific gravity[7] of 7.70 as compared with water and a specific heat[8] of 0.107, calculated as shown in Table 3.

Although this figure is unexpectedly high and represents a temperature sufficient to cause pain, a more accurate estimate lies somewhere between the 270 degrees F. rise for dentin and the 36 degrees F. rise for the No. 558 bur. Of course, it may be argued that the one unit of measured frictional heat, 0.33 c., is being arbitrarily divided and gage metal gets hotter than heavier gage, and so the thinner blades of the bur get hotter than the body of the head of the bur. Unfortunately, it is this hotter steel, the blades, which touches the dentin, and on the temper of the blades depends continued cutting efficiency. The generally observed extended life of steel burs when used with the fluid stream is here partly explained. Another factor is the elimination of débris and clogging, which mechanically chips and breaks fine steel blades. Also, since the blades get hotter than the head of the bur, so does the actual cut dentin surface of 7 sq. mm. become hotter than the entire 3.5 cu. mm. All the heat is necessarily inflicted on the open cut ends of the fibrils. This surface temperature may exceed many times that estimated, and if the bur re-

volves for more than one second, another proportionate multiple is secured.

An abstract in the *Journal of the American College of Dentists*,[9] from an earlier paper of mine, reached H. K. Warner, of the Australian College of Dentistry, University of Melbourne, and September 22, 1943, I received a letter from him which supports much of this work. He writes: "The local temperature at the bur may, under certain conditions, exceed 250° C., as indicated by the temper colours developed thereon. The temperature in the pulp chamber approximately 2 mm. away may be as low as 50° to 60° C."[10] In my own work, the high temperature arrived at by mathematical calculation seemed confirmed by drilling and grinding different fusible alloys, such as lead-tin solders, which melted into and clogged the blades of a steel bur. A similar phenomenon was noted in cutting the methyl methacrylate plastic materials. These are cut very fast when dry, as we all know, but I noticed that they were cut very slowly when wet, as the bur could no longer melt its way through the material. This may explain why the acrylics, although so easily ground in the laboratory, stand up remarkably well in the mouth, where the grinding of the teeth during chewing is so well lubricated that no frictional heat is produced.

CONCLUSIONS

The friction between steel burs and dentin forms a regular pattern or coefficient of friction. Heat is approximately proportionate to the frictional surface: the larger the bur, the higher the total heat and the greater the possibility of pulp trauma, but there is similar heat impact per dentin tubule from all burs. Although it is generally accepted that the total friction developed by steel burs is proportionate to the working area of the bur head, this is not altogether correct because of the intrusion of other factors. As larger burs are used, and friction increases, slipping of the engine belt and slowing of the motor become evident. Also, the greater cutting surface of longer burs results in distributing the operating pressure over a larger area, and if the total pressure is constant, the total frictional heat is also constant. The total frictional resistance is independent of the area of contact and, for two given surfaces such as steel and dentin, it depends only on the thrust or force between them.[11] The coefficient of friction between dentin and steel is fairly constant, varying mainly with the type of cutting: (1) end cutting or drilling type burs and (2) lateral cutting (most prevalent) which really grind. With a weak dental motor or a loose belt, it is doubtful whether large burs like the No. 560 generate more total heat than smaller ones like the No. 558.

The newly determined figure of 270 degrees F. rise under the stated conditions will probably surprise no one who has felt the appalling frictional heat from a dry bur as in carving or cutting a groove when a metal inlay is held in the fingers, or who gave serious consideration to the opening thought of the paper, which likened a bur to a special sort of lightning strip. Too many operators think of a bur as a small instrument, when in fact it is an endless and continuous frictional surface. The figure of 25 feet per minute was calculated in the following manner: No. 558 bur—diameter = 1.2 mm. — radius = 0.6 mm. Circumference equals $2\pi r$, or 3.77 mm. This when multiplied by 2,000 revolutions per minute (second speed) equals 7,540 mm., or about 25 feet. Twenty-five feet of No. 558 bur surface applied with 4 pounds pressure travels over each small section of vital dentin per minute, during average cavity preparation.

PRACTICAL OPERATING

Under experimental conditions, frictional heat was proportionate to speed

and pressure. If 2 pounds pressure was used instead of 4, the heat was approximately halved. While it seems that if speed remained constant and the operative pressure was reduced to 1 pound, the thermal rise would be only one quarter of the estimated figures for 4 pounds pressure, conventional operating procedures unfortunately stabilize the temperature at high impact levels. During actual cavity preparation, light bur pressure is usually accompanied by the employment of only a part of the bur length. If engine speed and pressure are constant, the benefits of a decreased working frictional surface are neutralized by the increased pressure per square millimeter. Therefore, the use of half the bur length with half the hand pressure will produce an equal heat impact per dentin tubule, as when the entire hand pressure is used on the entire bur length. The use of half the bur with equal pressure doubles the heat. This partly explains the pain caused by the use of the smallest burs, when heat causes maximum pain, but is insufficient to traumatize the pulp, even during abuse.

The foregoing phenomenon is ameliorated in some cases, since all pain from "drilling" is not from thermal impact, but is due partly to mechanical irritation. Smaller burs cause less mechanical traumatization than large ones and, as progressively smaller burs are used, a point is often reached where the diminution in pain becomes apparent. Thus, if heat alone were the cause of pain, and speed and pressure were kept constant, the use of the full 3.8 mm. length of the No. 558 bur would be less painful than the application of only part of its useful cutting surface. Minimal mechanical irritation may fall below the threshold of mechanical irritability. However, we have all observed patients whose threshold of mechanical irritability was so low that they were agonized by the friction of the smallest, No. ½ round or No. 33½, inverted cone burs used dry. Most patients of this type affirm the efficacy of "thermal control,"[12] although some exhibit sensitivity to such low thresholds of irritability that mechanical cutting alone results in maximum pain. In short, the use of the larger burs, No. 560, No. 5, No. 36, No. 703, etc., causes more pain than the use of smaller burs, because of greater total heat and increased mechanical traumatization.

THE FLUID STREAM

It is interesting to note that with the fluid stream of 8 cc. of water per minute, the maximum general temperature rise was 14 degrees F. during normal operating with the larger revolving instruments like large stones. This is well within the "temperature tolerance zone," and could never traumatize pulp tissue. Should increased pressure or speed be necessary, a similar increase in the rate of water flow would maintain a constant temperature.

Our preliminary work made evident the need for "thermal control," but some who were not willing to forsake the dry bur are attempting to avoid the use of a stream of water by using a liquid carbon dioxide device or a stream of air. The carbon dioxide apparatus is quite cumbersome, and many feel that it is impractical. Besides, the bur becomes so cold that it is a source of pain in itself. With this apparatus, there is probably a complete absorption of frictional heat, but débris is not cleared away as with other methods, nor is the method useful with stones. As for the second method, air is a poor heat sponge, with its negligible specific heat, and the constant use of a stream of even warm air on vital dentin would introduce the dangers of desiccation.

PRACTICAL APPLICATION

Clinically, we use from 90° to 120° F. water at a rate of from 10 to 20 cc. per minute. Besides the diminution in pain, increase in operative speed, complete

pulp safety and the extended life of burs, the carborundum stones maintain their shape and last a long time. A 250° F. oil treatment keeps handpieces and contra-angles in good condition,[13] and a modified saliva ejector maintains a suitable field of operation.[14] Although operative visibility may be impaired in some cases, it is more often markedly improved because of the darkening of carious areas when wet and the lack of accumulated débris. However, it is questionable, at this time, whether dental students can be taught to use the fluid stream from the beginning of their instruction. Perhaps they will have to acquire their "touch" on the dry specimen and later learn to work in a wet field to prevent pain.

SUMMARY

As a result of the work on "thermal control," heat trauma from revolving instruments should be recognized and prevented during operations hitherto considered safe, such as the gentle use of small steel burs. Careful operators have always used, and should continue to use, precautions against the gross type of heat, the generation of friction of a sufficiently large caloric value that, although distributed over a large area, the sequelae include pain, desiccation of dentin and pulp hemorrhage, and may include pulp death. We must now prevent the second, less obvious type, the generation of frictional heat over a relatively small area, of a caloric value sufficient to cause pain by the intensity of thermal impact per dentin tubule, but insufficient to endanger the pulp. The temperature of these small frictional areas exceeds the high tolerance zone limit of 130° F. and ranges from an estimated rise over body temperature of 67.5 to 270 degrees F., depending on individual operating speed and pressure (1-4 pounds). These figures are not intended to be accepted literally, but are estimates of potential thermal impact. Because of many variables, and experimental limitations, some of which have been mentioned in the text, it is probable that more accurate figures would be considerably higher.

The mathematically calculated thermal rises may be confirmed by observing (a) the temper colors which appear on the blades of dry burs, (b) the clogging of dry burs with fusible metals and (c) "melting," through high softening point thermoplastics, by the use of slowly revolving dry steel burs.

Since the second type of heat trauma occurs even with the gentlest use of the smallest burs, all cavity preparation by revolving instruments should be carried out under a stream of warm water. Rubber dam is contra-indicated except for final observation and minor finishing touches. With "thermal control," pain is prevented and the need for anesthesia is appreciably decreased, while operative speed is increased and pulp safety from thermal trauma is complete. It should be considered malpractice to anesthetize areas of pain which need never have been caused.

With the warm fluid stream, it is no longer necessary to "drill" intermittently, but steady, progressive, light pressure may be continuously employed.

All the work on "thermal control" applies not only to the cavity preparation of dentin, but also to the use of revolving instruments in bone surgery.

It is not intended that "thermal control," shall supplant modern anesthesia or to suggest that there is now no need for some new, more easily administered palliative. The technics of "thermal control" are especially necessary under anesthesia to prevent pulp trauma. Used alone, the prescribed technics will prevent much of the pain that is today endured as unavoidable.

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1235 Grand Concourse.

SULFONAMIDE THERAPY IN ACUTE PARTIAL PULPITIS

PRELIMINARY REPORT

M. EIGEN, D.D.S., Arlington, Va.

THIS report is concerned with an effort to restore to physiologic function the pulps of teeth undergoing some degree of inflammation. From the results noted in a test series of more than 100 cases, it appeared that cases of pulpitic involvement that were hitherto considered hopeless are amenable to treatment. Three cases are detailed in which earache associated with pulpal exposure and apical infection cleared up with apparent physiologic recovery of the pulps.

The destiny of most teeth in a state of either acute partial or total pulpitis is believed to be surgical removal. Occasionally, single-rooted teeth are left in position and root-canal therapy is applied. While pulp capping in carefully selected cases has been suggested in the literature, the results obtained by the practitioner have not always been gratifying.

In order to approach an old problem from a new point of view, it was decided to investigate the effects of selected sulfonamides on pulpitis. The majority of the test series might be considered as presenting acute partial pulpitis.

According to Kronfeld:

> Acute partial pulpitis is diagnosed clinically by pain in a tooth with a large cavity or filling. The attacks of pain are elicited by changes in temperature, especially fluids or cold air. After the thermal irritation has subsided, the pain continues for a while. The pain also occurs spontaneously, particularly at night. Usually the involved tooth has extensive caries extending into a pulp horn.[1] . . . The transition from partial pulpitis with occasional attacks to total pulpitis with continuous throbbing pain is a gradual one, usually developing over a period of several days. In a typical case of total pulpitis the pain is severe; the patient is kept awake at night. There is a gradual

transition from hyperemia to pulpitis, and then the pulp is lost.[2]

In several cases of the series, the cavities presented mechanical openings into pulp tissue. In others, treatment might have been sufficient had the cavities been sterilized with phenol and a mixture of zinc oxide and eugenol had been inserted. Between these extremes, the entire series of more than 100 cases can be placed. Roentgenographically, at least ten showed apical infection. About 50 per cent showed some clinical symptom of pulpitic involvement; i.e., painful throb, earache, temporal pain, painful chewing, etc.

The involved tooth was kept dry with cotton rolls and a saliva ejector. In no case was the rubber dam resorted to.

Fig. 1 (Case 38).—Preoperative view.

Because the vast majority of teeth presented near or actual exposure, conduction or infiltration anesthesia was administered. Each cavity was carefully cleaned out and warm aqueous zephiran (1-1,000) introduced on a cotton pellet. The various sulfonamides, separately and in combination, were then applied to the cavity depths and a mixture of zinc oxide and eugenol was inserted.

Approximately 10 per cent known pulp deaths are recorded. In appraising the percentage of casualties, it must be understood that little restraint was exercised in selecting the case. Virtually all conditions short of soft tissue involvement were treated. This was done solely to determine the limits of therapy. It is reasonable to assume that some of the extreme cases were regarded as possible failures at the time of presentation.

In five of the eleven known pulp deaths, granulomata were palpable at the apices of those teeth when examined after removal. Healing was generally uneventful. The only case requiring any postoperative attention was case 38, in a patient aged 65, whose roentgenogram is shown in Figure 1.

SOME INTERIM STATISTICAL DATA ON TEST SERIES*

Age Grouping of 85 Patients	Number of Teeth Treated
4½ to 10	5
10 to 20	25
20 to 30	19
30 to 40	18
40 to 50	10
50 to 65	4
Types of Teeth Treated	**Number of Types Treated**
Cuspids	5
1st bicuspids	18
2nd bicuspids	18
1st molars	36
2nd molars	28
3rd molars	6

*The average age of the eighty-five patients was 26.0647; the youngest, 4½; the oldest, 65. The lapse of time between treatment and extraction for the eleven known pulp deaths ranges from one day to 135 days. Of a group of forty-four cases, nine were treated nine months ago with one known pulp death; four were treated eight months ago with no known pulp deaths; twelve were treated seven months ago with three known pulp deaths, and nineteen were treated six months ago with one presumed death.

The roentgenogram revealed apical sclerosis. It is possible that the diminished vascularity associated with osteosclerosis enveloping the apex may have contributed in some measure to the delay in healing.

This patient came for examination, June 24, 1943, with a near exposure in an extensive buccoclusal cavity of the lower left second molar. She complained

of painful throbbings, especially at night, which had begun in February.

Under block anesthesia, the cavity was cleaned out and sterilized with aqueous zephiran. Sulfanilamide powder was placed over the area of near exposure and an orthophosphoric cement filling inserted. Four days later, when the tooth was removed, there was evidence of apical infection. The postoperative attention consisted of introducing a sulfa pack into the alveolus on three successive visits.

This case is of interest because of the more or less violent reaction noted whenever cement fillings were substituted for zinc oxide and eugenol in near exposures. Apparently, sufficient uncombined orthophosphoric acid was usually present to aggravate the irritation of the pulp. Three of the eleven known casualties were in this group.

From the absence of any untoward effects from cement fillings in five other cases, it was presumed that one determining factor in the condition might have been the relative thickness of dentin overlying the pulp. That thickness also protected the pulp from the application of pressure incidental to insertion of the filling. It is quite probable that the fillings in these five instances contained little if any uncombined acid.

That the sulfonamide therapy is not attended with any risk, even in those cases which may have been considered hopeless at the time of treatment, may be inferred from the healing of the extraction casualties. Soft tissue swelling, even in one pulp death after 135 days, was notably absent.

Of interest in this question of risk is the anticipated failure of case No. 27. (Fig. 2.)

The upper left first molar, which was reported as being alternately quiescent and throbbing, had been continuously tender to chewing since originally examined, July 3, 1943. After the initial visit, radiolucency was noted at the apex of the lingual root. It was retained in position upon the insistence of the patient, despite advice to the contrary. No soft tissue swelling has occurred to date.

Perhaps the most remarkable occurrences were noted in cases 1, 8 and 77. All three presented pulp exposure, throbbing earache and roentgenographic evidence of apical infection. All three gave every evidence of physiologic recovery. A fairly detailed case history with accompanying roentgenograms is herewith given of each of the three cases.

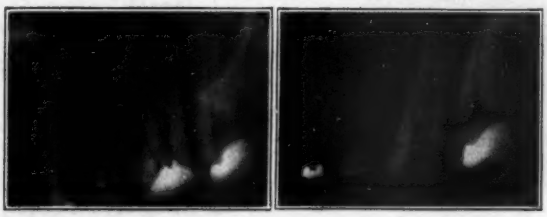

Fig. 2 (Case 27).—Anticipated extraction. Left, preoperative view. Right, postoperative view.

CASE 1 (Fig. 3).—A boy, aged 15, seen July 29, 1943, complained of a tooth that had started "rumbling" two weeks previously. July 28, he experienced the worst seizure of all, which kept him awake until 3 a.m. The previous nights were restless ones and sleeping was fitful. The patient reported an earache of two weeks' duration and also recalled a sharp pain referable to the temporal region.

Under block anesthesia, the cavity was cleaned out and sterilized with warm aqueous zephiran, followed by the application of a 5 per cent solution of sodium sulfadiazine.

A small sulfa pack was placed in the depths of the cavity and a mixture of zinc oxide and eugenol inserted.

In order to relieve the presumed vascular engorgement, the patient was given several poultices to place in the buccal fold. When the anesthetic wore off two and a half hours later, he reported the persistence of a slight earache. All pain, however, stopped within four hours after the application of a poultice. To date, there has been no recurrence of pain except on two occasions when hot and cold liquids were permitted to touch the tooth. The pain was significantly momentary.

November 24, the mesial filling was removed without benefit of anesthesia and a vital response elicited. (Fig. 4.)

Fig. 3 (Case 1).—Preoperative view.

Fig. 4 (Case 1).—Preoperative view.

The preoperative roentgenogram revealed apical infection associated with wide open exposure of the mesial horn. (Fig. 4.) The postoperative roentgenograms up to about November 1 continued to reveal apical infection, although of decreasing magnitude. (Fig. 5.)

The postoperative view, taken on November 24, showed quite distinct resolution of the apical infection.

This, as far as I know, is the first reported resolution of an apical abscess in which the pulp gave every evidence of physiologic recovery.

This does not appear to have been an occurrence of no significance in view of the following cases:

CASE 8.—The patient, aged 11, seen July 26, 1943, complained of an earache. A roentgenographic examination revealed a wide open exposure of the lower right first molar together with distinct apical infection. (Fig. 6.)

Under block anesthesia, the cavity was cleaned out and sterilized with warm aqueous zephiran followed by a 5 per cent solution of sodium sulfadiazine. A cotton pellet saturated with warm aqueous zephiran was used to carry sulfanilamide powder to the area of exposure. Over this was placed a mixture of zinc oxide and eugenol.

Fig. 5 (Case 1).—Postoperative view (after four months).

Fig. 6 (Case 8).—Preoperative view.

There has been no reported pain to date. October 30, the filling was removed without benefit of anesthesia and a vital response was elicited. (Figs. 7 and 8.)

Of unusual interest in this case is a condition of functional sclerosis detectible in the postoperative views. As the case progressed favorably and the pulp apparently recovered, the sclerosis diminished.

CASE 77.—A boy, aged 17, seen April 6, 1943, complained of a throbbing toothache,

facial pain and earache, which had kept him awake most of the previous night. (Fig. 8.) Roentgenographic examination revealed a wide open exposure of the mesial horn of the lower right first molar. A break in the lamina dura of the distal root was detectible. A very extensive cavity was evident in the lower right second molar. A view ten days after operation, like the preoperative view, shows the break in lamina dura.

Under block anesthesia, both cavities were cleaned out and sterilized with aqueous zephiran. Zinc oxide and eugenol was inserted directly in the extensive cavity of the lower right second molar. A sulfa pack was introduced into the lower right first molar and covered with zinc oxide and eugenol.

The patient, incidentally the first in the series, was instructed to return for an anticipated extraction later in the day. Four hours later, he appeared, reporting the absence of all discomfort. However, some of the sulfa pack, which is hardly discernible from the zinc oxide and eugenol mixture, had apparently been exposed to the saliva and had dissolved, the filling presenting a "cancellous" appearance. At this sitting, the filling was removed and the cavity resterilized with zephiran and repacked with zinc oxide and eugenol.

June 25, the filling was removed without benefit of anesthesia and a vital response elicited. To date, the tooth has been completely quiescent. Several of the postoperative roentgenograms revealed a slight sclerosis enveloping the apical half of the root. During the period of observation, the patient was placed on a régime of dicalcium phosphate and viosterol. Since it was felt that no therapeutic effect was evident, this was not repeated in any of the subsequent cases.

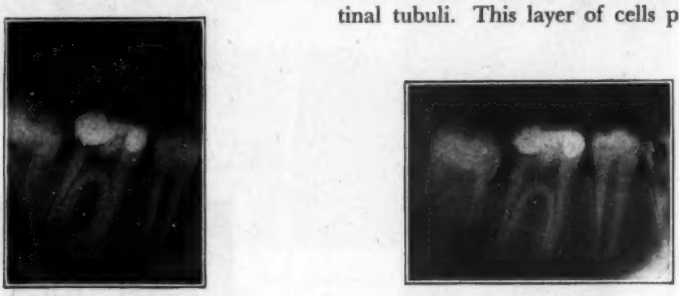

Fig. 7 (Case 8).—Intermediate views.

DISCUSSION

As a consequence of this investigation, it was felt that the attempted treatment of conditions of acute partial pulpitis requires: 1. A clear picture of the immediate structures involved. 2. Roentgenographic and clinical evidence. 3. Antisepsis.

With the hope that none will be offended and because the advent of several new drugs demands it, a résumé of basic information pertinent to this investigation will be presented.

Lining the periphery of the pulpal chamber is the layer of odontoblasts from which fibrils extend into the dentinal tubuli. This layer of cells protects the delicate pulpal contents from chronic irritation by deposition of secondary dentin. It is when the irritating forces overwhelm the protective mechanism that exposure, pulpitis and necrosis ensue.

The pulp itself is composed of relatively thick coated arterioles, soft nonvalvular and non-collapsible venules, peripheral capillaries, lymphatic fluid, nerves and some undefined connective tissue. The acknowledged deficiency of a collateral circulation acts to hasten necrosis.

It is pathognomonic that the pulp is contained within an unyielding chamber.

The rhythmic rush of fresh blood into the injured pulp accounts for the throbbing character of the pain. Increased pressure of the arterioles against the soft venules at the foraminal opening eventually prevents the removal of accumulating toxins and thus induces necrosis of the pulpal contents.

Roentgenographic evidence of acute partial pulpitis, at best, is merely inferential. It is logical to presume that the lymphlike fluid in the dentinal tubuli channel bacteria and their toxins from an area of near exposure directly into the peripheral area of the pulp. Generally, then, the depth of a cavity is a fairly accurate measure of pulpal involvement.

The phagocytic defense mechanism in the pulp follows the same general pattern as it does elsewhere in the body. In the early stages of pulpitis, the involvement is fairly well confined to the pulpal periphery adjacent to the area of near or actual exposure.[3] As the involvement develops, this confinement is gradually extended until the defense line is breached and the pulpal contents undergo extensive necrosis.

That is the general histopathologic picture which may be presumed to be developing in the teeth shown in Figure 9, a and b.

The clinical picture of pulpitis, while not always reliable, may be suggested by a dull ache, at times reflex, arising without apparent (external) cause. The extension of the infection into the peridental membrane usually serves to localize the discomfort in the involved tooth.

Paroxysms of lancinating pain may occur whenever the extensive cavity is such as to be vulnerable to the pressure of packing food. Some exposures have been known to occur beneath a completely intact occlusal surface.

It seemed plausible, at the time this therapy was conceived, that if an antiseptic were available which would not only more effectively sterilize the cavity, but also operate therapeutically within the periphery of the pulp itself, the natural defenses of the blood and lymph might be sufficient to resolve the pulpitis.

An antiseptic was sought that would not only be effective against bacteria, but would also spare the tissue as well.

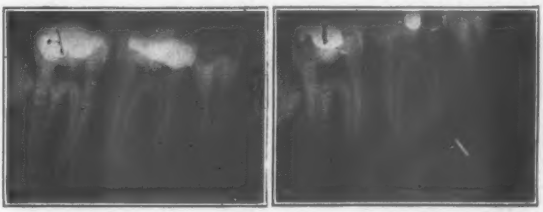

Fig. 8 (Case 77).—Left, preoperative view. Right, film taken ten days after operation.

Neither phenol nor absolute alcohol qualified, since their toxicity indices are respectively 4.0 and 7.5. An antiseptic with a toxicity index greater than 1 is more destructive to tissue than to bacteria.[6, 7] The toxicity index for zephiran is reported as 0.48.

Since zephiran is not only a relatively new antiseptic, but is also unreported clinically as a tooth cavity sterilizer, it might be well to describe it here. It is a quarternary ammonium type of wetting agent containing a mixture of alkyl radicals ranging from C_8H_{17} to $C_{18}H_{37}$ and the source of which is a mixture of fatty acids of coconut oil. The aqueous solution (1-1000) has a pH of approximately 7.1.[4] The higher concentrations are progressively more alkaline. It has a low surface tension and therefore is

presumed to be very penetrating. It is notably non-irritating. Marked *in vitro* inhibition of dental bacteria has been reported.[5]

The literature on sulfonamides[8] is too voluminous, and at times too conflicting to warrant publication of more than a few pertinent facts. The sulfonamides as a group seem to exhibit a greater bacterial specificity than zephiran does. Locally they are overwhelmingly more effective than when equivalent amounts are given systemically. While untoward reactions have been reported in the use of sulfonamides, none were detectible in the local application to tooth cavities of this series.

It would serve no urgent need, in a preliminary report, to go into much detail on the various combinations of sulfonamides used. However, following is a list of those used:

1. Sulfanilamide powder.
2. Sulfathiazole powder.
3. Sodium sulfathiazole solution (5 per cent).
4. Sodium sulfadiazine solution (5 per cent).
5. Sulfathiazole paste.

It appears from the known properties of both the sulfonamides and zephiran that they would be expected to complement each other in pulpal exposures. The sulfonamides are generally believed to be essentially bacteriostatic, depending on vascular factors to phagocytose the susceptible organism. If the activity of the sulfonamides were entirely confined to avascular dentin, the therapeutic effect would be questionable. However, the concomitant use of aqueous zephiran (1-1000) with an indeterminate variety of sulfonamides, I believe, increases the therapeutic result, probably by increasing penetration and concentration of the latter. It is reported by Bellows[9] that "the greatest concentration of sulfathiazole within the aqueous humor after application is less than 1 mg. per cc.; with a wetting agent the concentration reaches 10 or even 20 mg. per cc." Evidence continues to accumulate attesting the synergistic properties of a variety of drugs when used together with the sulfonamides.[10, 11, 12, 13, 14, 15, 16, 17]

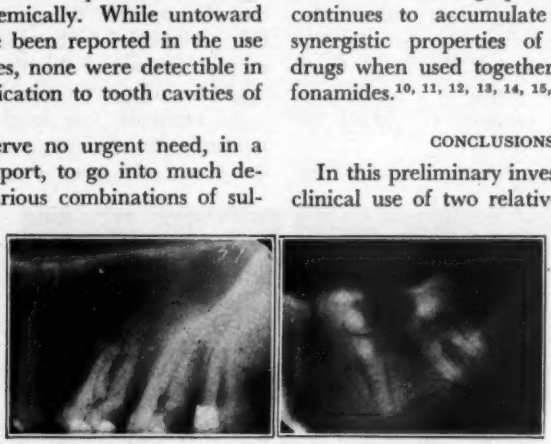

Fig. 9.—Views suggesting histopathologic changes.

CONCLUSIONS

In this preliminary investigation of the clinical use of two relatively new drugs, i.e. selected sulfonamides and aqueous zephiran (1-1000) for conditions of acute partial pulpitis, three cases are detailed with roentgenographic evidence in which earache associated with pulpal exposure and apical infection have cleared up with apparent return of the pulps to physiologic function.

It appears from the results noted in the entire series of more than 100 cases that conditions of pulpitic involvement hitherto considered hopeless are amenable to treatment.

The advent of the relatively new drugs, sulfonamides, and the quarternary ammonium type of wetting agent would appear to demand a readjustment of attitude toward antisepsis, especially in relationship to the pulp.

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ACUTE NECROTIC GINGIVITIS (VINCENT'S INFECTION); SEASONAL AND AGE RELATIONS*

S. C. MILLER,† D.D.S., and W. M. GREENHUT,‡ D.D.S., New York, N. Y.

IN this statistical report of cases of necrotic gingivitis that were presented for treatment from 1938 to 1942 at the Periodontia Clinic of New York University College of Dentistry, the data were derived from the photographic files and case records of the clinic, since every case that is treated by a student is recorded in photographs for teaching purposes before and after treatment is given and a periodontal diagnostic chart containing the necessary oral and systemic history is made and examination and clinical diagnosis are completed for all cases.

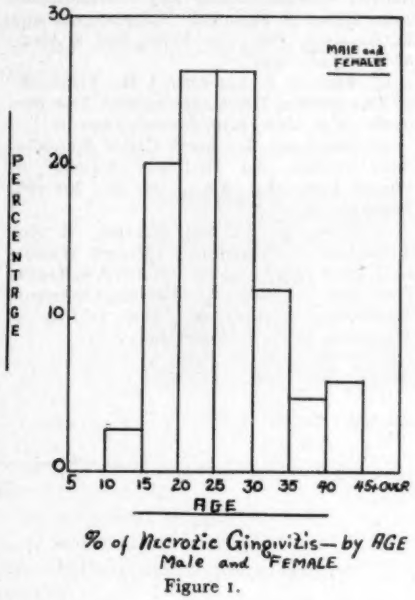


Figure 1.

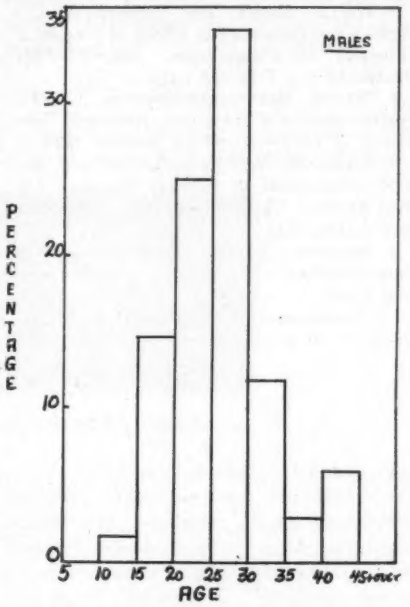


Figure 2.

The statistics are compiled on a monthly basis to determine the possibility of seasonal incidence. Age and sex incidence were also studied. It will be noted that the month of August is not indi-

*Data tabulated and organized statistically by A. A. Rothman, D.D.S., instructor in periodontia, New York University College of Dentistry.

†Associate professor in charge of periodontia, New York University College of Dentistry.

‡Assistant professor of periodontia, New York University College of Dentistry.

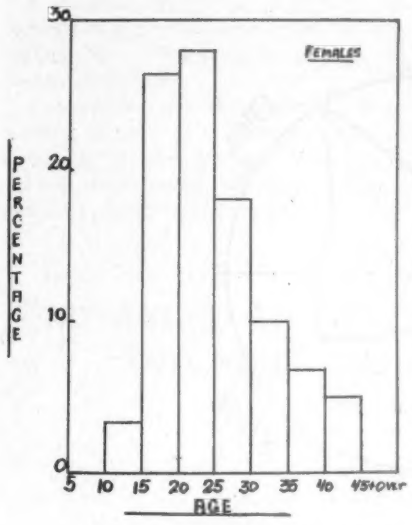


Figure 3.

and generalized were chosen because it was believed that these cases would be readily diagnosed as necrotic gingivitis (Vincent's infection) by the average practitioner. Spontaneous gingival hemorrhage, destruction of interproximal papillae, submaxillary glandular involvement, *fetor ex ore*, pain and pyrexia were present in all cases.

Figure 1 indicates the number of cases in a total of 127 males and females which appeared each month. It will be noted that the greatest number of cases were recorded in the fall and winter months. October was the heaviest month, with twenty-five cases.

Figure 2 shows the combined age incidence of males and females. The chart indicates the prevalence between the ages 15 and 30, the rise commencing at 15, with a sharp upspurt at 19 years of age.

Figure 3 shows the maximum age incidence for males as between 20 and 30,

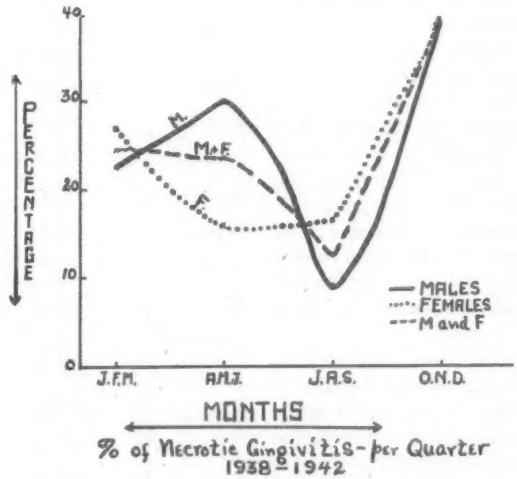
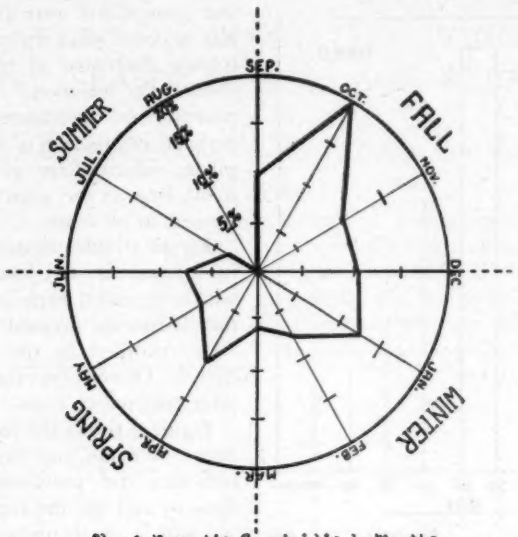


Figure 4.

cated, as the Periodontia Clinic was closed during this month from 1938 to 1942. In order to evaluate the statistics properly, only those cases that were acute

the rise commencing at 19 and being sharpest at 22 years.

Figure 4 indicates the maximum age incidence for females as between 15 and



% of Necrotic Gingivitis by Months
Male and Female 1938-1942
Figure 5.

25, the rise commencing at age 15, with a marked upspurt at 18.

The graph in Figure 5 shows the percentage of cases in each seasonal quarter. There is a gradual rise during the variable weather of spring, then a great drop in the summer months, in New York, followed by an upgrade trend in the months of October, November and December. It is to be noted that the clinic is closed in August, but this can be disregarded because of the continual decline of cases into September, when the clinic was reopened.

The percentage of cases tabulated by months for both males and females is shown in the table. The greatest number of cases (twenty-five) are shown during the fall season and of this quarter during the month of October.

PERCENTAGE OF CASES BY MONTHS

MONTH	FEMALE		MALE		MALE+FEMALE	
	#	%	#	%	#	%
JANUARY	7	12	8	11.9	15	11.8
FEBRUARY	4	6.7	5	7.5	9	7.1
MARCH	5	8.3	2	3.0	7	5.5
APRIL	5	8.3	8	11.9	13	10.2
MAY	5	8.3	3	4.5	8	6.3
JUNE	–	–	9	13.4	9	7.1
JULY	2	3.3	2	3.0	4	3.1
AUGUST*	–	–	–	–	–	–
SEPTEMBER	8	13.4	4	6.0	12	9.5
OCTOBER	13	21.7	12	17.9	25	19.7
NOVEMBER	6	10.0	6	9.0	12	9.5
DECEMBER	5	8.3	8	11.9	13	10.2

*NOTE - Clinic is closed during AUGUST

CONCLUSIONS

1. Necrotic gingivitis (Vincent's infection) among civilians is most common between the ages of 15 and 30 in males and females. This finding coincides with the age incidence of eruption of the third molars, with the corresponding lowering of resistance of the oral tissues.

2. Necrotic gingivitis (Vincent's infection) is prevalent during the fall season in New York, mainly during the month of October.

3. It appears that the apparently large number of cases of necrotic gingivitis in service is at least partially due to the age of those under observation (pericoronitis period)and the altered climatic conditions under which they may be serving.

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ADVANCED THOUGHT IN INDIRECT INLAY AND FIXED BRIDGE FABRICATION

PART II—DENTAL ENGINEERING

(Continued from pages 759-768, June 1, 1944)

E. S. SMYD, D.D.S., B.S.D., Detroit, Mich.

Perhaps one of the most important factors in cavity form is the physical character of the casting that will occupy the cavity. For emphasis, let us point out that it would be unreasonable to make a thin mesioclusal or distoclusal bridge

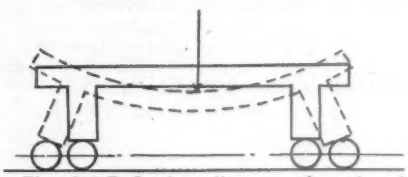

Fig. 8.—Deflection diagram of a dental bridge with freely supported abutments.

abutment casting of soft gold. If it is desirable to use a soft gold, the cavity preparation should be cut deep and the filling must be well confined within the tooth. Even so, the procedure is not recommendable, for the concensus of opinion holds that rather hard golds must be used for bridgework and partial denture protheses. Experience and an analysis of prosthetic problems clearly point out that this view is substantial.

Force acting upon the span of a bridge produces compression of the fiber in the occlusal portion of the bridge and tension in the fiber of the alveolar portion. If the castings supporting the bridge were free to move, we would depict such a structure under strain by the dotted lines. (Fig. 8.)

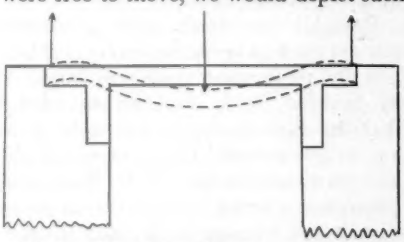

Fig. 9.—Deflection diagram of a cemented and successfully retained fixed bridge.

When the castings are cemented to their abutments, this will not take place because the mechanical engagement of the castings with the teeth, the bone surrounding the teeth, the approximating teeth and the cement resist the free movement of the castings. The strain

diagram under these conditions would look somewhat like Figure 9.

These two drawings are profoundly significant. Earlier in this article, the statement appeared that one of the important factors in the success of many dental appliances is the mobility of the teeth. When teeth are tight in their sockets, there is greater need for strong abutments than when the abutment teeth are loose. When teeth have mobility, the wracking and twisting of the bridge framework, which are due to the masticatory pressures and torque, are absorbed by the hydraulic action of the suspended teeth. When the peridental membrane is thin, bone is dense and the abutment teeth are in interproximal contact with other teeth, there is every reason to believe that the foundation is fixed enough so that the stresses and deflections recognized in engineering operate in dental structures. Just how important a rôle the following analysis may play must await the verification of more critical methods. It is presented here purely on a theoretical basis and supported by such verification as the exposition affords.

Probably the teeth most commonly lost are the first permanent molars. These are the teeth most frequently replaced by bridges. It is common knowledge that the average person can exert from 150 to 300 pounds of biting force on the first permanent molar. G. V. Black once conducted a series of experiments to ascertain the average force used in masticating various foods of the civilized diet. He discovered that from 60 to 90 pounds was not uncommon in the mastication of beefsteak, and it is reasonable to assume that pressures greater than this may be used under some conditions. Let us assume that a bit of bacon rind, a bone or some hard object in the food finds its way onto the occlusal surface of a molar bridge. This being an accidental occurrence, the object will be stressed through impact. Generally, forces operating on beams or on the pontic of the bridge structure, as in the case here, on impact cause a much greater deflection of the beam than a gradually applied load would occasion. Consequently, 60 pounds pressure exerted in the uniform load on a first molar pontic might, under impact, be two or more times greater. For purposes of simplification, let us assume that a pressure of 100 pounds is exerted in a concentrated load on the molar pontic, and, to further simplify the investigation, let us say that the pontic is a sanitary bridge having average dimensions; that is, having an occlusal width of one-quarter inch, a mesiodistal span of three-eighths inch and a thickness of one-eighth inch. To use the engineering formula for computing maximum stress in a simple beam, one supported at each end, but free to flex on its supports:

$$\text{Maximum stress} = \frac{\text{bending moment}}{\text{section modulus}} = \frac{M}{S} = \frac{wl}{4} \div \frac{bd^2}{6}$$

$$= \frac{wl}{4} \times \frac{6}{bd^2}$$

Where w = 100 pounds force on the pontic
l = ⅜ inch span = 0.375 inches
b = ¼ inch width of occlusal = 0.25 inches
d = ⅛ inch thickness of pontic = 0.125 inches
Substituting these values in the formula:

$$\frac{M}{S} = \frac{wl}{4} \times \frac{6}{bd^2}$$

$$= \frac{100 \times 0.375}{4} \times \frac{6}{0.25 \times (0.125)^2}$$

$$= \frac{37.5}{4} \times \frac{6}{0.00390625}$$

= 14,400 pounds per square inch

The last figure represents the stress in the outermost fiber of the molar pontic of a bridge freely supported on its abutments.

All computations in engineering are based on the theory that the structures designed must be capable of withstand-

ing the most extreme loads imposed thereon, and this figure is generally multiplied by a safety factor of 2 or more, depending on the particular case in hand. Were we to apply this practice to dental computation, we should have to use not 100 pounds pressure, but 300 or 400 pounds. It is clear from the foregoing calculations that if we were to multiply 14,400 by 3 or 4, and then multiply this figure by a safety factor of, say, 2, we would be well beyond the range of the proportional limits of the dental golds used for this purpose. Only the very hardest dental golds approach an elastic limit of around 50,000 pounds per square inch. Fortunately, we do not have to meet such extreme conditions. Habits of eating and civilized fare being what they are, these computations do not mean much except in one respect: They can be used to explain why certain dental bridges fail even under the very restricted use to which they are put.

In order to standardize the findings, if we calculate the maximum stress in the same bridge pontic as it would apply in the second diagram, that of a fixed bridge, we should have to use the formula for computing stress in a beam with fixed ends. For a concentrated load in the middle of the beam (pontic) the formula is:

$$\frac{M}{S} = \frac{wl}{8} \div \frac{bd^2}{6}$$

$$= \frac{100 \times 0.375}{8} \times \frac{6}{0.25 \times (0.125)^2}$$

$$= 7{,}200 \text{ pounds per square inch}$$

To make the comparison complete, let us take the case of the semifixed or loose-joint bridge. The formula is:

$$\frac{M}{S} = 0.192\,wl \div \frac{bd^2}{6}$$

$$= \frac{0.192 \times 100 \times .375}{\frac{0.25 \times (0.125)^2}{6}}$$

$$= 11{,}059.2 \text{ pounds per square inch}$$

Observe that as the bridge is fixed to, first, one tooth, the stress in the bridge pontic is reduced from 14,400 pounds to 11,059 pounds per square inch, and that when it is fixed at both ends, the stress in the pontic is further reduced to 7,200 pounds per square inch. What is the significance of these findings? The explanation, to use engineering terminology is: Restrained members introduce bending stress into the columns supporting them. This means to us that, although bending of the pontic is reduced by fixation, the reduction is secured through introducing bending in the abutments. The medium hard inlay golds having a Brinell hardness number of about 90, which are commonly used in bridge fabrication, have an elastic limit of around 20,000 pounds per square inch. While the figures reached above for the stress in the pontics of the various types of bridges fall within the elastic limits of the golds that we use, in consideration of the magnitude of the stresses we must conclude that, in cemented bridgework, not only are pontics bending rather significantly, but the bending may actually involve abutment castings to a degree to cause them to loosen. The bending is undoubtedly responsible for the fracturing of porcelain pontics. It may also be responsible for the frequent failure of certain types of fixed bridges, characteristically those supported at either or both ends by monangled, mesioclusal or distoclusal inlays. For fixed bridgework, it is imperative that adequate strength be provided in both

bridge abutments to withstand the vastly increased demands upon resistance and retention concomitant with fixation. Obviously, since fixation introduces stress into the abutment castings, the cement and the prepared teeth, the coupling medium between the bridge framework and the foundation must be capable of withstanding the bending of the abutment castings without a violation in the physical properties of the system.

I have measured the dimensions of a great number of prepared cavities picked at random to discover whether the bearing surfaces, that is the surfaces supporting the pulpal and cervical floors of the inlays made to fit these cavities, would be adequate in area to support the inlays against probable loads without exceeding the physical properties of the cement. I computed the values first as they would apply for individual fillings, and then as they would apply were the inlays to act as bridge retainers. In direct compression, the bearing surfaces of almost all the cavities would support all probable loads brought to bear upon them without exceeding the crushing strength of the cement bond when the crushing strength of the cement was taken at 13,000 pounds per square inch. This rather high value for cement is achieved only by the better grades, and only when properly handled. It is questionable whether the average mix of dental cement often approaches this figure. The loads that the castings would carry would not affect the physical properties of the cement bond in direct compression, but the castings supporting bridges almost never transmit the loads to the cement in such a manner as to place the cement of the broad pulpal and narrow cervical floors under direct compression.

I have set up a series of experiments in order to see just how the bridge works, to explain the difference in stress in the pontics in Figure 8 and Figure 9. Structures resembling dental bridges were cut out of cardboard. The supports that acted as analogs of the teeth were pinned to a drawing board at a point one-third of the way up from their bases. This point was chosen because Stuteville, in his experiments on dogs, concluded that the axis of rotation of teeth in their sockets was in the apical third of the root of the tooth. There may be some question as to this. Actually, this locus is not important. It may be moved occlusally or apically over rather wide limits without appreciable effect on results. The "bridge" was then placed on these supports and stress was exerted on it. All kinds of bridge structures and some of the abuses of bridge construction were studied by this method, with some surprising revelations. One of these was that if the bridge supports are pinned at their supposed axes of rotation, they rotate on these axes very little if at all, even if the bridge span is stressed to the point of rupture. Certainly the movement of the foundation, experimentally, is much slighter than that of the deflections of the bridge structure. The validity of the observations might justifiably be challenged in their application to actual dental cases because there may be some bodily movement of the abutment teeth in their sockets when they are subjected to axial stress. This is hard to gage and simulation experimentally is perhaps impossible. But where the foundation is secure, the laws and computations of engineering would seem to hold. If this is the case, we must anticipate harsher impositions upon the physical factors of the castings, and particularly on the cement that binds them, than we ordinarily associate with the task.

In all the cases studied, the bridge structure tended to bend in a manner resembling that shown in Figure 8. If we consider only the movements of the various components of the bridge without the restraining influence of the cement, the box portions of the castings (the columns) move down to place the

cervical floors under direct compression, there is a bending of the columns at the level of the pulpal floors of the abutment castings and the isthmuses and dovetails buckle very perceptibly upward. This is true whether the abutments are fashioned as monangled anchorages or as mesioclusodistal.

Special effects of bridge design lend themselves to study by this method. Thus, by slenderizing certain component parts of a bridge preparation, that part can be made more sensitive to the stresses operating in the bridge if other factors remain unchanged. Also, I have found pinning of the various parts of the bridge to the drawing board with long straight pins very instructive. These pins sway to and fro when the pontic is stressed, and the direction of the stress can be gaged in this manner. Even the effects of immobilizing the component parts of the bridge anchorages as cement would do can be simulated. One of the greatest surprises was the discovery that even greatly tipped abutment teeth move very little toward each other when they are pinned to the drawing board at their simulated axes of rotation, and the bridge span is stressed.

Since the bridge models are made of cardboard, their behavior under stress is two dimensional. In order to observe the effect of the dovetail of monangled castings under these conditions, it was necessary to improvise a bit. The dovetail normally has its disposition in the width and depth of the casting, and since the model shows only length and depth, it was decided to subvert the dovetail into the position shown by the diagram, Figure 10. Its behavior under these conditions is not identical with its behavior in its customary dimensions, but it serves the purpose. The discrepancy due to this improvisation will become evident when we consider the means of increasing the efficacy of the dovetail. When the rigidity of the isthmus, the dovetail, and the column decreases as in slenderizing these components of the abutment, the deflection at x, Figure 10, becomes greater and greater. As the dimensions of the column, the isthmus and the dovetail are increased, angle B of the accessory diagram of Figure 10 becomes smaller and smaller and, as it does, stress in the pontic tends to be absorbed by the abutments and the cement more and more favorably. The accessory diagram is a resolution into force vectors of the resultant force, C, of Figure 10, generated by the deflection of the pontic, isthmus and dovetail. The slope of line c of the accessory diagram is identical with that of Figure 10. Vector c repre-

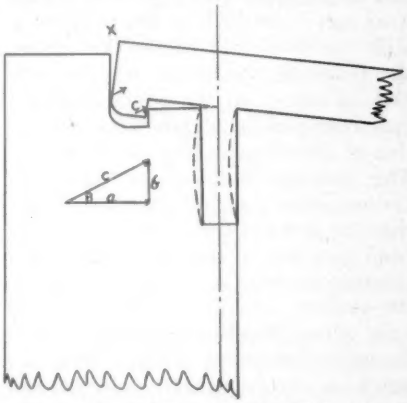

Fig. 10.—Deflection diagram with a force vector supplementary analysis of one end of the experimental "fixed" bridge.

sents a resultant force, exerted by one surface of the dovetail (the axial surface nearest the pontic) against the cement binding it in the cavity. This resultant force has in it the elements of compression and shearing stress which the accessory diagram brings out. Stress set up in the pontic as a result of bending is absorbed in the following manner by the abutment castings and the cement:

1. There is compression of the cement of the cervical floor under the proximal flanges of the castings or "columns" of

the bridge. If the abutments of the experimental model are fashioned to be mesioclusodistal, the flanges opposite the columns move away from their respective cervical floors when the columns are under compression.

2. There is a resultant force (c) against the proximal axial surface of the dovetail, having as its components the force vectors shown in Figure 10, (a) in compression and (b) in shearing stress.

3. The cement lining all other surfaces of the dovetail and isthmus is in tension or under shearing stress.

If we regard the bridge structure as a unit and disregard the cement or regard it as only incidental, as the masonry is with respect to a steel framed sky-scraper, the following conditions may be verified: Pressure on the pontic produces compression of the occlusal fiber and tension of the alveolar fiber of the pontic. The proximal flanges of the abutment castings, since they are generally thinner than the depth of the pontic, will tend to bend in a sort of hingelike action on a plane at the level of the pulpal floors of the cavities. This places the surface of each column that is adjacent to the tooth in tension, while the surface facing the pontic is in compression. The column has a tendency to bow and thrust the tooth to which it is attached anteriorly or posteriorly, as the case may be. The axial surface of the dovetail which is proximal with respect to the pontic tends to prevent this action. The isthmus is placed in tension. Owing to the curve of deflection set up by stressing the pontic, the dovetail is lifted out of the occlusal receptacle for it. The abutment teeth themselves move very slightly toward each other. This is because the predominant stress is directed axially by the flanges of the castings, and this stress tends to move the teeth clockwise or counterclockwise, depending on which side of the axis of rotation of the root the column is resting. The occlusal component of the abutment casting moves flection at the terminal occlusal margin upward in an arc having its greatest deflection at the terminal occlusal margin (x of Figure 10).

Since it acts as a column, the proximal flange of each abutment casting should be reasonably heavy and have a flat cervical floor. If it is thin, it will be deflected sidewise too easily, with the result that stress on the retentive features of the castings will be excessive. This is undoubtedly the cause of the notorious misbehavior of certain bridge anchorages; namely, the pinledge, which, as it is usually executed, has no proximal box or column. Since it also has little resistance form in its flat facets, too great a sidewise stress is brought to bear against the retention pins where it should not be exerted.

The isthmus should be reasonably thick without encroaching upon physiologic function. Fortunately, rigidity and strength in this portion of the casting can be greatly increased by rather small extensions of depth or width, or both. The rigidity of the isthmus is a function of a cubed power with respect to its depth and length; consequently, small increments in its depth serve to increase its rigidity remarkably. To approximately the same degree, lengthening the isthmus, as in the preparation of a mesioclusodistal abutment, weakens it. By increasing the rigidity of the isthmus, and squaring the cut of the dovetail, it may be possible to hold these components of the abutment-casting to such tolerance as to prevent alteration of the physical properties of the cement bond. Another and much more satisfactory method of increasing the rigidity of the isthmus and column of the casting, because it is physiologically more desirable, is to provide a reenforcing external rib or web of gold. We are all familiar with this device, for we have all used it as the three-quarter crown.

When one considers that the masti-

catory effort is exerted not only in a vertical, but also in a horizontal plane, it becomes apparent that the combined effect of torque and deflection causes wracking and twisting of the bridge framework, placing the monangled abutments at a disadvantage. One of the rules of engineering in designing members is to place as much metal as possible as far away from the neutral axis of the member as possible. This increases strength and economy. Essentially, this is what occurs in the making of a three-quarter or full-jacket crown. Boxlike structures like these are not only more desirable physiologically, but also, for an equivalent amount of metal, when they are compared with monangled castings, they are more rigid and consequently better adapted to withstand the wracking and twisting resulting from the masticatory effort. Perhaps even more to the advantage of the latter attachments is the fact that, when cemented to their abutments, they engage a much greater area of cement. Since the successful retention of cemented prostheses requires provision against the shearing stress of the cement bond and, further, since resistance to shearing stress, other things being equal, seems to be a matter of relative bonded areas, the advantage is obvious, being even greater than a mere comparison of shearing surfaces, for, from the experiments with the cardboard models, it was concluded that the cement lining the axial surface of the dovetail proximally from the pontic is under compression and shearing stress; whereas that lining the opposite axial surface of the dovetail is in tension and under shearing stress. In the case of the three-quarter and the complete jacket crown, the surface which is to be compared with the proximal axial surface of the dovetail becomes in reality the opposite axial surface of the attachment; that is, the axial surface opposite the column of the bridge structure, and the cement under this large area is in great part under compression, which is, again, the condition under which dental cements carry their burden best.

Abutment castings fall into two general categories: they are divided on the basis of whether they possess a proximal box or column. A shoulderless jacket is an example of an abutment without a column. The behavior of abutment castings without columns in supporting bridges is different from that of castings having columns. In the case of the former, the jacketed tooth itself acts as its own column. In the case of the latter, the gold of the proximal flange is in effect the column.

The pontic should have as much gold in its deep dimension as possible. In the formula used earlier, $S\ max = \frac{wl}{4} \times \frac{6}{bd^2}$ the depth of the pontic is denoted by d. It will be observed that it is a squared quantity. Consequently, small increments in the depth of the pontic contribute greatly to its strength and, therefore, rigidity. This rigidity will manifest itself through reduced deflection, and this, in turn, will impose a lesser bending strain in the columns and isthmuses.

The conclusions here reached have been based on the concept of a concentrated load in the center of the pontic with the abutments out of occlusion. However, the bridge behaves in a manner similar to that described in the experiment, even under normal use, for if the bolus of food has a fibrous or tough consistency, the brunt of the load will be borne by the pontic and the prominences of the cusps of the abutment teeth. The isthmus and dovetail might well be out of contact with the masticatory pressures exerted on the bolus. The only difference between this condition and the one being considered is that the bridge would be under uniform loading instead of concentrated loading, and the calculated values would be about half as great.

Also to be considered as a deciding

factor in the indication of a rational anchorage for a bridge abutment is the type of bridge construction to be attached to it. Referring to our formulas for the computation of stress in a bridge pontic, it can be seen that the stress in a pontic of the semifixed type falls half-way between that of a simple beam freely supported at both ends and a beam with fixed ends. This would seem to mean that the loose abutment is free of stress caused by deflection and possibly, to a great extent, free from occlusal torque, but the fixed abutment is enduring as much stress and strain as though both ends were fixed. This is not exactly true. Clinical experience teaches us that smaller primary abutment castings may be used with success where the semifixed principle is employed. This is possible because the loose joint permits the bridge structure and the retaining tooth to move very perceptibly. It was pointed out earlier that appreciable movement in the bridge foundation abrogates the engineering principles here laid down in connection with deflection.

An interesting and important corollary from the digest of the two preceding paragraphs is that if one desires the utmost in the matter of support, say of a weakened foundation, the fixed bridge stands as the choice. Given abutment castings that are adequate, fixation, or the closest approach to fixation as provided, for example, by the precision attachment of a partial denture, is the most satisfactory means available to dentists to secure maximum support from a foundation with minimum trauma to it. In securely fixed prostheses, the stresses take place in the bridge structure and the anchorage; that is, the composite of the abutment casting, cement and the part of the tooth containing the cavity. The tooth itself moves but little, and most of the load is transmitted axially through the tooth to the bone. In this way, bone is best able to take stress. Semifixed bridgework is practicable for short spans where the abutments are substantial. However, stresses set up in the bridge structure through torque and masticating pressure are in a greater measure transmitted as lateral forces through the tooth to the peridental membrane. It is these lateral forces that we try to minimize to protect teeth from periodontoclasia.

Inasmuch as the deflection diagram of Figure 9 is only applicable when the casting is absolutely immobilized on the abutment, the cement bond must be capable of resisting the stresses caused by the restraining action. Will it be? Let us consider the monangled abutments, because these are the most likely to be deficient. The cervical floor is usually of such dimension that even though the cement at this location is subjected to compression, the stress that it is best able to take, its crushing strength could easily be exceeded. From our experiments, it seems that the cement on the pulpal floor would be subjected to tension. Since cement has no adhesion, the only tension is that which will result if the cement is locked into an undercut somewhere along the isthmus and dovetail and the whole gross fill of a cement base in the cavity should be stressed within the tooth. A certain amount of compression of cement takes place upon the surface of the dovetail proximally from the pontic. The only other factors in immobilization of the castings on their abutments are shearing stress of the cement projections into the irregularities of the tooth and dentinal tubules, and the irregularities of the casting, and direct mechanical engagement of the casting with the tooth through the medium of the dovetail. If we do not make substantial provision in the metallic orientation of the abutment castings, we are depending on cement to take the stress in a manner in which it is least able to do so.

When monangled castings are used to support bridgework, the dovetail must be exactly square cut and it must be

somewhat deeper than the isthmus. In fact, it must be deep enough that, for physiologic reasons, it must be cut as a dowel groove upon some external surface of the tooth, usually the buccal or the lingual. It thus is made more difficult for the operator to secure an accurate impression of such a prepared cavity. However, the impression technic of today is adequate for the accomplishment of this end. Now, to explain why it is necessary to cut the dovetail square and relatively deep: If Figure 11 is visualized as representing a mesiodistal section through a molar tooth, and quadrilateral ABCD as being a section across the would be effective in resisting torque. If, as we have discovered, the radii BQ and CQ operate to displace the dovetail, where Q represents the intersection of the neutral axis of the column with the plane at which bending of the column takes place and acts as a fulcrum, the pitch of the dovetail walls becomes much more critical.

Observe that, even with the walls of the dovetail perpendicular to the occlusal plane, wall BE affords little more resistance to displacement than that required to shear the cement. If wall CD has a pitch that would fall to the right of arc CQ, it would also afford little

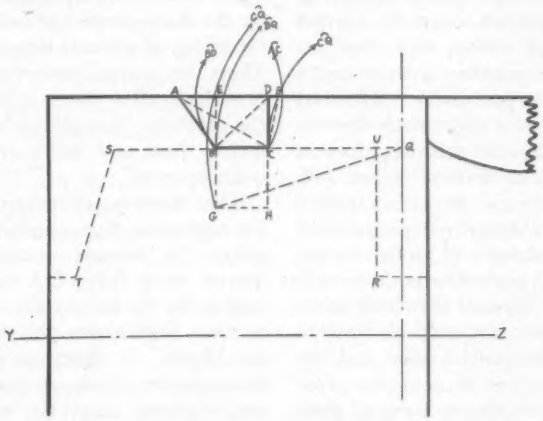

Fig. 11.—Mesiodistal section through a molar tooth illustrating the resistance to torque afforded by the dovetail of an abutment casting.

mesiodistal breadth of a dovetail, torque exerted on the dovetail will tend to produce a fulcrumage at A or D, depending on whether the torque is directed in a counterclockwise or a clockwise direction, respectively. If the arcs struck by the radii AC or BD lie within the casting or the cement lining, the dovetail affords little resistance to displacement.

Figure 11 shows that arc BD does pass through the casting. A dovetail with this degree of pitch offers very little resistance to displacement. Arc AC passes through the tooth, and a dovetail with this pitch mechanical resistance to displacement. Only the strength of the cement under shearing would serve to immobilize a casting with such a pitch. By extension of this reasoning, one is led to believe that since CD is the strong retaining wall, a mesioclusodistal abutment possesses less resistance to displacement than a mesioclusal or a distoclusal abutment, because, for the semifixed type of bridge construction, wall CD can be pitched to form an obtuse angle DCQ, which will still permit the casting to go to place if CD is parallel to UR; whereas, in a

mesioclusodistal preparation, ST cannot be parallel to UR except in the extreme case. As the mesioclusodistal preparation is usually executed, ST inclines sharply toward UR. Where an abutment casting must go to place simultaneously with a second abutment as in fixed bridgework, angle DCQ cannot be an obtuse angle. In the most extreme case, DC will be perpendicular to the plane of occlusion and the reference line YZ. Generally, because the abutments are rather widely separated, the operator will even prefer to have angle DCQ slightly acute in order to make certain that the bridge will go to place.

In view of the fact that a great deal of cavity preparation must be carried out by mirrored vision, and that recourse to optical parallax is necessary, a discreet pitch is permissible. Observe, however, that even a slight pitch destroys all of the mechanical retention inherent in the dovetail, as shown by line CF. It is interesting to note that if we modify a mesioclusal or distoclusal preparation by cutting an axial dowel groove on the lingual or buccal surface or both, to such a depth that its cervical floor will lie on a plane somewhere intermediate between the plane of the pulpal floor and the plane of the cervical floor of the proximal flange, the resistance form of these two-surfaced castings is greatly strengthened.

We may ascertain by referring again to Figure 11 that, as we extend the lingual or buccal dowel below the plane of the pulpal floor, line GQ in the illustration becomes the hypothenuse of the right angle triangle BGQ. GQ, being the hypothenuse, is longer than line BQ, and in order for the dowel to turn on torque operating from Q as a center, point G would have to traverse the arc set up by GQ as a radius. This is impossible, as this arc moves through tooth structure. Such modified monangled abutment castings have remarkable resistance form, provided GE is not pitched to such a degree that BQ becomes longer than GQ. Should this be the case, the abutment casting would be deprived of much of its resistance form. The solution to such an eventuality is, of course, extension of the dowel farther apically.

If we accept the premise that abutment castings should be self-retaining through all the vicissitudes of torque and deflection, it is desirable, nevertheless, to provide against shearing of the cement bond. Other things being equal, the greater the bonded surfaces, the greater the security of the casting. In view of the fact that resistance to shearing stress is a surface phenomenon, the value of rather extensive preparation such as that for the three-quarter or full-jacket crown for bridge abutments seems to be proved. There are several anchorage devices for prostheses, all of which purport to answer the purpose. It would perhaps be well to review these now in the light of present considerations.

The three-quarter, "triangled" casting combines fine appearance with rigidity. It presents a marginal outline shorter than that of a mesioclusodistal casting for the same tooth. This is a fact of some importance, for this line should be, ideally, as short as possible. The three-quarter casting employs dowels that are relatively near the surface of the tooth. Where it is used in the posterior teeth, the cubical shape of these teeth provides three parallel walls, which, in themselves, offer an excellent opportunity for the cement bond; consequently, pronounced doweling is not necessary.

The pinledge affords a fine esthetic preparation, but unless it is used in conjunction with a loose-joint bridge, the sequel of a well conceived and well executed restoration may be disastrous. Much too frequently, the pinledge will work loose when it is used on fixed bridgework, caries will quickly invade the tooth, deeply along the pin holes, and, in a brief span of time, destruction will become so extensive that reclaiming the tooth for

an abutment without devitalization becomes a problem as great as it is embarrassing. The reason for this peculiar behavior of the pinledge is explained under the considerations of bridge stresses. We might add that the preparation as it is generally executed consists of producing a proximal and lingual wafer of hard gold. The lingual plate bears three pins which furnish the attachment with retention. Resistance is obtained by three flat facets surrounding the pins. Bridge stresses are of such magnitude that this thin envelop is strained and flexed and the cement bond is destroyed. The pinledge, if used, should probably be employed with a doweled proximal box, and a well-ribbed or a thickened lingual plate.

The "quadrangled" gold jacket, unless veneered with a porcelain facing, is ruled out on esthetic grounds. Where esthetics is not a prime consideration, as for molar abutments, the jacket may be used to great advantage. In most of these cases, however, the three-quarter crown can be made to do service rather easily, without the sacrifice of appreciable retention or rigidity.

Bridgework employing a recess and dowel in one of the abutment castings, the semifixed type, can be constructed admirably and very successfully on two monagled castings if due consideration is given to resistance as well as retention form, and if sufficient rigidity and square-cut features are developed in the primary retainer. But where caries has invaded the tooth to a considerable depth, it is better not to depend on the tooth to withstand occlusal torque by an intracoronally retained abutment when, with less grinding, an extracoronally retained abutment can be made that not only will take greater stress, but also will actually strengthen and support the weakened tooth.

In consideration of the foregoing data, abutment preparation should make use of the doweling principle. The procedure should be so executed that each casting will possess two or more dowels. Usually, two recesses for dowels will be cut in the bucco-axial and linguo-axial line angles. Others may be cut anywhere in the crown of the tooth provided they are all parallel and their disposal does not violate esthetics or good surgical technic. They need not necessarily be parallel with the long axis of the tooth. Their parallelism will be more completely governed by the path of insertion of the bridge or partial denture that they will support. Usually, additional dowels will be placed on the lingual or buccal aspect of the tooth, their position depending on its state of preservation. In any event, wherever cut, the dowel recesses must all be united by cutting channels of adequate depth in the tooth structure to provide sturdy ribs of gold in the casting. Sufficient additional tooth structure must then be reduced to provide a beveled edge and an envelop of gold in the finished casting that will afford the shortest marginal outline possible. The beveling and the general reduction of tooth structure should not be carried to the extreme of sacrificing the retention of the dowel grooves and channels. The accuracy of present-day impression technic is of such an order as to make possible extremely precise castings, castings so precise that there is little need for burnishing margins.

Although two of the dowels are usually placed along the bucco-axial and linguo-axial corners of a shallow box in order to thicken and make more rigid this part of the abutment casting, and also to provide room for bridge rests or partial denture attachments, it by no means follows that this must always be the case. Frequently, abutment teeth already have serviceable fillings involving much loss of tooth structure and precluding further weakening of the tooth by grinding in the sulcus or the other approximal quadrant; or the one abutment tooth, usually the molar, may be greatly tipped

while the other abutments are not. In these cases, it may be well to cut the dowel grooves on the buccal and lingual aspects of the tipped abutment, parallel to each other and to the long axis of the normal abutment or abutments. The presence of a tooth distally from a tipped abutment tooth often prevents the placing of a jacket for fixed bridgework. This is merely mentioned in demonstration of the facility with which the indirect doweled casting may be used in solving troublesome problems.

SUMMARY

The following dogmas should guide the novitiate.

1. All the axiomatic principles set down in the opening paragraphs of this article should be kept in mind.

2. As nearly as possible, the cutting of a mesioclusodistal cavity should be avoided. These cavities require excessive reduction of tooth structure. They are less substantial bridge abutments than well-prepared mesioclusal or distoclusal inlays. They are also the most difficult to record in an impression and the most apt to be distorted.

3. The simplest cavity to record in an impression is a mesioclusal or distoclusal cavity. For bridgework employing a loose joint, some modified form of mesioclusal or distoclusal cavity should be used. The dovetail is extended across the full buccolingual width of the tooth or, better, into a dowel groove on the buccal or lingual surface, or into grooves on both surfaces. The isthmus is cut deep enough to make it rigid, the walls of the dovetail are as nearly perpendicular to the occlusal plane and the cervical floor as possible, and axial dowels are used.

4. Dowels are not to be cut into weakened tooth structure along the buccoaxial or linguo-axial line angles of the tooth if it is to act as a bridge retainer. One might risk using a mesioclusal or distoclusal casting for a bridge abutment in a tooth weakened by extensive caries, provided such castings are relieved of occlusal or intermaxillary torque bearing on the pontic by a loose joint, but must not use an internally retained abutment in a weakened tooth as a primary retainer.

To be continued.

YOU WHO OPERATE FOR CHILDREN

WALTER C. McBRIDE, D.D.S., Detroit, Mich.

THIS is a thought-swapping presentation. It is based on the premise that Children's Dentistry, covering such a multitude of dental sins, is a very debatable subject. I hope I may provoke you to a discussion status.

Primarily, among the swapping possibilities I am concerned with why so many good operators—good operators in adult dentistry—do such faulty work for children. I know so many dentists who do excellent operative work for adults, and Jekyll-and-Hyde-like do such miserable work for children.

In my reference work I see so many loose "faith" fillings. I mean proximal restorations secured on faith alone, without a step preparation, fillings which might be picked out at random. The unfortunate part of these conditions is that devitalization usually occurs before there is evidence of faulty technic. Joint fillings, that is, two proximal cavities served by a single filling, are equal offenders. Good operators who would not think of so filling two proximal cavities for 40-year-old Mr. Brown, proceed to do this very thing for Mr. Brown's 4-year-old Johnnie and, as aforementioned, devitalization is certain to occur. Not in both teeth necessarily, but usually only in the one in which the filling is least securely locked. In mastication teeth have independent movement, and assuredly, over a period of time, the tooth in which the filling is least secured will become devitalized and infected.

Cement fillings have a habit of doing the same thing. There may be some merit in the copper cements if properly manipulated, but, as far as plain crown and bridge cement is concerned, I think it entirely valueless. Not so long ago I watched an instructor in a dental school prepare a distoclusal cavity in a lower second deciduous molar, which involved as well the greater portion of the lingual surface. He was lending a hand to an embryo clinic student, and to my amazement I watched while a thin mix of oxyphosphate cement, as a permanent filling material, was flowed into the cavity. Certain am I that in less time than it took for the cement to set, an amalgam filling might have been placed and carved.

I shall never forget the day, in the beginning of my practice, when a very irate parent brought her child to my office and upon her entry expostulated, rather than inquired, "Can you put in pusless fillings?" I learned, as well as observed in the course of the appointment hour, that she had become discouraged with dentistry for her child which amounted to none more than the common cycle of cement filling, lost filling, infection, which she labelled pus, and eventual extraction. Today, she wanted to ascertain in advance if she could secure fillings without the resultant pus. In her case the batting average had been almost perfect, in a reverse fashion, much to the discredit of the profession and inconvenience to the child.

Dr. Easlick, custodian of the graduate and undergraduate children's departments at the University of Michigan, School of Dentistry, has said many times

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that in two weeks after insertion, or less, a cement filling is smaller than the cavity. And to my knowledge his information is authenticated by the Bureau of Standards at Washington. It takes no great master mind to assimilate the fact that cements contract upon setting, while amalgam expands, and to further pursue these characteristics, one seals the cavity while the other makes way for marginal carious disintegration. Buckley's desensitizer and devitalizing agents are only amateur actors in the devitalizing field compared to the rôles of these three colossal, superheterodyne stars: "faith" fillings, "joint" fillings and cement restorations.

Now I ask you—you who operate for children—why do you think this is so? Sometimes I think it is because the operator cannot be bothered with children, so to speak, but mostly I believe it goes back to the management problem, wherein the operator is more frightened of the child than the child is fearful of what may be done to him. In doing work for children one cannot divorce management from operative procedures, and if a dentist is really frightened of children, it might not be a bad suggestion that he studiously pursue this phase of his work with the same zest and inclination as he does any new denture technic or oral surgical procedure.

MANAGEMENT AND ECONOMICS

I repeat, in children's dentistry one cannot divorce management from operative technic. In the same fashion, and which I think is of equal concern, one cannot divorce management from economics.

A girl of 8 years was referred by a dentist who had had her in his office four times. There she had consented only to getting in the chair for rides up and down but not for examination. In my reception room, the mother was given a free hand to induce the child to come to the operating room, but to no avail. When the mother had exhausted all her possibilities, I appeared and remarked, "What's the trouble?" The child was sprawled in a big chair with one foot on the floor, the other up in the air directed at my approach. She remarked rebelliously, "If you come near me, I'll kick you." Promptly, she was picked up bodily and hurried into the operating room, amid a few kicks and verbal rebuffs, and seated (thrust) in the chair with a gesture indicative of action and intent, and accompanied by the remark, "In my office, I'll tell you what's going to be done. Now sit there and let's not hear one word from you. I'll tell you what to do. Open your mouth and let's see your teeth." Actually, in the face of her ultimatum to me, the child was so amazed at my audacity in carrying her into the operating room and thrusting her in the chair, with the accompanying remarks, that she was completely deflated. There was no resistance to any remark or command thereafter, and she proved to be an excellent patient. Now, I ask, can you imagine me with my Scotch heritage pumping a child up and down in my chair for four appointments on a noncompensatory basis?

One of the choice classics in my office occurred within this last year. A four-year-old girl was referred to me with no mention of what had gone before and, contrary to the usual rule when a behavior problem is relayed and known, the mother came in with her, a mother about 40 years of age with her first and only child. This youngster was placed in the chair against her wishes, then proceeded to shut her eyes tightly and cry as loudly as possible—not screaming from fright, but busily occupied with crying. I have the usual casual stock remarks, followed by a few threats, for such behavior, one of which will usually bring about some vestige of reasoning on the part of the patient; but not so with this child: she was adamant and completely oblivious to her environment; she was

busy making a job of her crying. Exhausting my verbal possibilities, I suddenly grasped her by the shoulders and said, "Are you listening to me?" One young patient went home and told his mother I pounded his chest, which was his way of telling that I tapped him on the shoulder, to arrest his attention that he might listen to what I had to say. When I used similar tactics with my crying Juliet on this day, the mother promptly remarked, "You can't do that to my child," to which I promptly replied, "All right then, the appointment is over," and forthwith removed the towel, placed the child on the floor and started ushering them out of the room. By this time, the mother was slightly abashed at the rapid turn of events as well as the brevity of the appointment hour, and said, "Why, I expected you to instil confidence." "Sure," I replied, "I do, too, but I won't out-yell a child. My first procedure is to acquaint the child with the fact that what I say is important and to be heeded. And until I get a child listening to what I say and talking back to me by way of answering my questions, I've failed so far as the instillation of confidence is concerned."

A short time ago I took the starch out of a twelve-year-old boy in the first two or three minutes in my chair because there was too much protestation during the examination, by saying, "Now listen, young man, I know already why Dr. Jones sent you here. You've been telling him what to do. The plan in this office is that I make all the rules. The sooner you recognize that, the better it will be for you.

I'm fair and kind to anyone who is fair and considerate of me, but if you won't play that way, then you'll get a good demonstration of how tough I can get and how quickly." No age group, boy or girl, is more difficult to manage if he presents a management problem, than a 12-year-old.

Please understand me; when I think of management, I am not thinking in terms of the psychiatrist who proceeds to make children tractable so they will not be misfits in society. I am interested in tractability only to the extent that my work is made easier, both for the patient and for me, and as well because it means dollars and cents both for the payer and me. I have long since learned that even the extremely wealthy will not willingly pay me for entertaining their children. They want dentistry in exchange for the money I exact.

Poor management results in poor dentistry and poor dentistry in repeat work. Consequently, there is loss of income and loss of face. When I am called upon to replace a lost filling, I am ordinarily annoyed by the loss of productive time required for its replacement—that means dollars and cents to me—but I am more annoyed by the fact that my style of dentistry suffers a derogatory appraisal.

The simple, casual remark that "John's filling fell out" has sufficient economic possibilities to concern a business psychologist. And, regardless of the operator's years of experience or his extreme care, there will always be some occasions where fillings will become fractured or lost, but they should be few. If it is the operator's fault, there is no law against such admission, and sometimes it is good for the soul, and for the practice. If a filling is lost shortly after insertion, I know it is the fault of the operator—my fault—and I proceed to explain it as such, admit my chagrin, replace it as graciously as I can, while stating, "this one is on the house." However, you and I know that the major portion of the so-called lost fillings, those lost over a period of time after insertion, is due to carious destruction about the margin, and such should not be the burden of the dentist. How one can explain away these numerous lost "faith fillings" and stepless fillings I am not prepared to say, but here is one dentist, I assure you, who is endeavoring to avoid the need for such explanations.

THE INITIAL DENTAL VISIT

You who operate for children, when do you recommend your young patients make their initial visit? I raise this question because the postgraduate group in Children's Dentistry and Public Health at the University of Michigan gathered some pertinent data this last year relating to it.

To be truthful, the writer thinks the idea was initiated because he had gone off too frequently and too profusely on the thought that generally speaking, four years was the ideal age for the child's first dental appointment. My thought on this matter has been based on the information that a child's reasoning powers are not developed until approximately that age. Thus, with a child presenting at two years, anything that might be done, even to the prophylaxis, must be done under protest. And, realizing that children prove such victims of habit, I felt that the protestations would become fixed and require a number of difficult appointments to eradicate them. On the other hand, if the child presented initially after the reasoning possibilities had matured, all the indifferences and protests could be eliminated, through friendly, instructive comment or reprimand, at the first appointment.

The suggestion of making the initial appointment at three and a half to four years of age is not made so much in the interest of the operator as that of the patient. A little noise or confusion, more or less, is no event in the daily affairs of a pedodontist. The average child patient —adult as well—feels the way he thinks he feels. If it is the habit to cry, he immediately begins crying, and thereby feels out of sorts and indisposed. If the tendency to indifference is dispelled at the first appointment, the patient's morale is improved and his behavior becomes advantageous to the operative accomplishment.

In a survey of 312 children in an orphanage where I had provided the routine dental services for a number of years, the following caries index was revealed:

In the three-year group 13 per cent showed occlusal caries, 34 per cent of the four-year group, 52 per cent of the five-year group, and 70 per cent of the six-year group showed both proximal and occlusal caries.

Now, I grant you, there are a few two-year-old children, and some younger, with rampant caries, but it is the unusual, and if so, it is a very obvious condition which the parents can have cared for as and when they see fit. Generally speaking, cavities in three-year-old children are almost always occlusal in location because the second deciduous molar has not approximated the first molar sufficiently long at that time to produce proximal caries. Personally, I have not encouraged early visits, yet have accepted patients at any age. I admit authorship of the statement which the group mentioned, that early care of children would not be quite so early if the theorists were to do the work, not to mention the economic control of the office.

The result of the children's group survey showed some interesting facts which I am pleased to present. In their questionnaire they inquired, "At what age should a child first visit a dentist?" Their letters were sent to private practitioners, public health workers, and teachers throughout the country. Of seventy replies, four advised before 2 years; nine at 2 years; thirty-two at 2-3 years; seven when all his primary teeth had erupted; nine at 3 years; three at 3-4 years; two at 4 years, and four were unclassifiable, but indicated very early age.

Again I do not wish to appear adamant. It is my desire to make children's dentistry easy and appear easy. Generally speaking, dentists are not public health-minded or children's dentistry-minded, and certainly do not wish a daily parade of crying, protesting two-year-

olds through their office on a "have-a-look-without-pay" basis. And if the idea were once initiated, I am certain they would not encourage the periodic return over the next two years on the same noncompensatory plan. But give them a youngster at four who can talk and act and respond after a fashion like a grown-up and they will evince some interest. And in so doing, they will still catch the 34 per cent with caries in the initial stages while sending 66 per cent away with only prophylaxis.

CONTRACT DENTISTRY

In "Juvenile Dentistry," I have stated:

Children's dental work, almost of necessity, must be handled on an hourly basis. This is true because of the variance in the behavior problem and the vast difference in accomplishment per appointment with different children. No one will ever derive any great pleasure from Children's work so long as he uses the fee-per-operation plan for the stipulation of fees. A fee-per-hour basis will maintain the morale and composure of the operator when working for an obstreperous child who demands more than the expected time. It will also equalize the cost of fillings. A fee-per-hour basis will better satisfy the parents and make them as desirous as the operator in detecting and caring for small cavities—a factor which, in itself, entails periodic visits and consequently constant income to the operator. . . .

Some operators who have a great many children in their practices employ the yearly contract arrangement, i.e., a fee-per-year basis paid usually in twice-yearly installments. It includes all necessary dental attention except orthodontic needs and is usually arranged on the basis of a ten-year plan, from three to four years to thirteen to fourteen years of age. The child is required to return three times yearly for prophylaxis and periodic needs and at all other times if and when trouble occurs. The fee is established on the premise that during these years the dental needs of a child consume an average of two and a quarter operative hours per year. Thus two and a quarter multiplied by the established fee-per-hour, common to that office, gives the yearly rate.

CONTRACT DENTISTRY

Contract dentistry appears to be of orthodontic origin. The orthodontist believed originally that fees should be based on a monthly or yearly basis. The pedodontist, when he came along, evidently casting an envious eye on the luxurious life common to his orthodontic friend, inquired of himself, "Why not care for children on a similar basis?" And so a new departure in fee setting was born. Obstetricians today commonly exact an over-all fee for care during pregnancy and delivery, and many pediatricians stipulate a flat yearly fee for pediatric care during the first year of the new born. Further, it is the clever Chinese, I think, who pays his physician to keep him well. For both the operator and the payer, this plan in dentistry for the child has many fine advantages and, as well, some disadvantages.

I was only luke-warm to the idea until a few years ago, when Dr. Charles A. Sweet, salesman that he is, and a good one, waxed enthusiastic about how it operated for him. He had been caring for a number of children in an orphanage at an hourly rate and deduced therefrom that the plan could be converted to use for private practice. So he began. He has altered his original practice plan considerably but, so far as is known, he still utilizes it.

Encouraged by Dr. Sweet's enthusiasm and biased by his business acumen, I began the paper planning incident to the incorporation of his plan in my practice. I had long since learned that a pedodontist could ably care for 1,200 children, and having that number, and a few more, began some calculus and mental gymnastics as follows: 1,200 patients, $25.00 per year each; $30,000 gross income; could provide ideal dentistry without parental questioning regarding treatments, x-rays, or anesthetics; vacations no longer costly because of the yearly fee; hereafter, orthodontist-like, I could enjoy the trout-fishing season, the deer-

hunting season, the pheasant season, the national meetings, as well as the regular meetings, and the regular vacations with the family, without interruption of the income. Utopia, thought I, and I couldn't wait until tomorrow to begin.

A folder of explanation was at once prepared, to be given out to new patients and to the old on their periodic return. But a wise counsellor said, "Put nothing in writing, lest the advice and opinions of family dentists and dental friends be sought and the idea be discredited by the unscrupulous few." So the idea was initiated with verbal presentation, which proved to be far too time-consuming. Briefly, it stipulated all dental needs except regulating and spacing appliances, three prophylaxes per year, together with all operative needs and emergency service; a ten-year service, four to fourteen.

It was early learned that $25 per year was too high to interest all possible takers and so the utopian paper gross of $30,000 had not only to be sliced, but materially whittled. Another fact soon encountered was that people were not generally interested in buying this type of insurance; they more or less had to be sold on the idea. To abbreviate a long story, perhaps only fifty children were placed on this yearly fee plan.

The working arrangement with these children was ideal for me. I could proceed unhampered and without questions as I saw fit. The compensation came in semi-annual installments and promptly. Today, however, I have only two patients on this basis, both of the same family, and when they become of age the idea will have terminated. To me, the disqualifying features have been:

1. The promiscuous time consumption of those patients who take the liberty of coming in unheralded or calling for appointments promiscuously, two or three times as frequently as when on the regular basis. These parents, arrogantly feeling that they are paying for this service, appear to have no qualms about disturbing a tight schedule of appointments for me, or discommoding the patients who have those appointments.

2. The "reneging" in families of two or three children, of which one child may have few dental needs and the others many. The child with the good teeth will be withdrawn from the agreement, while those with greater needs will be retained. I am not censuring the parent for this procedure, which curtails his financial outgo, but I maintain specifically that it disturbs the effectiveness of my planning, which is based on the law of averages. It definitely nullified the idea for me because, after a time, only those with the greater dental needs remained.

I know a dentist who feels that he has solved the latter problem by having a sliding scale fee for children of varying dental needs. His yearly fee is based on his ability to guess, at the initial appointment, the future dental requirements of the child. I am familiar also with a plan in adult dentistry in which the fee is $25 per year plus laboratory and material costs. This dentist writes a contract on a five-year basis with renewal privileges. His first task is to restore the mouth immediately and then, to use his term, "coast the remainder of the contract with only regular prophylaxis and the intermittent small filling." There are so many possibilities in adult dentistry that one could not make a worthy appraisal of it without some experience.

Charles A. Sweet, in writing concerning my trial at Contract Dentistry, states:

> Some of your experiences with contract service have been very similar to mine. In 1931-1932, when the economic depression really hit California, contract service was quite successful, but, at the present time, with so many defense projects located hereabouts and everybody employed at a good wage, people are not the least bit interested in buying this type of insurance. But what will happen when we have another economic depression? Shouldn't we be ready to give

the public what they want and still maintain our standards of practice?

Dr. Ward, former dean of the University of Michigan Dental School, says: "Health Insurance is as inevitable as fire insurance" and, "the battle for health insurance is over." He is aware of some of the objections to insurance dentistry, but the question that lingers with him is, "Are we going to attempt to remove the objections and retain the principles of insurance?" He also raises the questions, "Do we want the government to develop the plans or will the profession do it?" He feels it would be wiser for us to experiment further rather than abandon insurance dentistry. And so do I. And you, gentlemen, you who operate for children, what think you?

660 Fisher Bldg.

INFLUENCE OF HEREDITY AND ENVIRONMENT ON THE CARIES PICTURES OF MONOZYGOTIC TWINS

WILLIAM H. BRUCKER, B.S., D.D.S., Newark, N. J.

THE subject of twins and mistaken identity has been a literary device for many centuries. However, not until the last twenty-five years has the dentist begun to direct his attention to this phenomenon of embryology, genetics and psychology.

It has been, for the most part, a problem of the orthodontist. Korkhaus,[1] Goldberg,[2] Bachrach and Young,[3] Braun,[4] Silverman[5]—all have conducted major researches on the subject. Yet all, save Silverman, fail to devote any notable space to a consideration of dental caries in twins. It will be the purpose of this paper to inquire into the caries picture of monozygotic twins, and to attempt to evaluate the relative effects of heredity and environment on these caries pictures.

Steadman[6] defines twinning as the "production of equivalent structures by division; the tendency of divided parts to assume symmetrical relations."

Human twins may be classified as monozygous or heterozygous. Heterozygous, or "fraternal," twins are actually biovular siblings of like or unlike sex which suffer a simultaneous gestation and an almost coincidental parturition. In the latter case, two ova instead of the usual one are fertilized by two separate sperm. Here we have the origin of two new individuals that have no closer relationship than siblings born at different periods. Monozygous, or "identical," twins are derived from a single fertilized ovum which has undergone fission to present two new individuals with a common heredity. It will be demonstrated later that the term "identical" is a misnomer, and so I shall henceforth refer to these twins as monozygotic. One out of every eighty-eight births presents twins, and one out of every four twin births is monozygotic.

It is to the monozygotic twins that attention is to be directed in this paper. These are the true uniovular twins. It is in these groups, with their heredity fixed, that we can compare the relative

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effects of heredity and environment on the individual.

EMBRYOLOGY AND GENETICS OF TWINNING

Immediately after the ovum is fertilized, segmentation begins. In the embryos destined for twinning, there is a temporary cessation or retardation at a critical period in the development. Stockard has proved the occurrence of this temporary cessation by experiments on fish eggs.[7] When roe were maintained at a low temperature for an hour and then returned to normal temperature, a number of twins were produced. It thus follows that the low temperature caused a cessation of the vital functions at vital stages in the development of some of the eggs.

Silverman[5] explains that a retardation in development may be the result of "an understimulation of the egg due to a defective development-initiating mechanism of the sperm, a belated placentation due to the inability of the corpus luteum to stimulate the uterine mucosa," a recessive gene for twinning causing either of these conditions. This modification in the normal rate of development results in fission, and a new right and a left half form as two separate developmental centers. Each new half individual reorganizes its own axiate relations and regenerates a new right or left half, becoming again a whole individual.

Professor Newman[7] offers the best explanation for the entire process:

There is present in a young embryo a certain organizing region, a region that unifies and holds together component cells and makes them behave like an organism. Organizing centers in embryos are well known

TABLE 1 (CASE 1).—CARIES PICTURES OF S AND H*

		Right				Left		
		S	H	H	S			
	6	C-dp	F-dp			6		
		F-mp	F-mp					
M	E	F-dp	F-dp	C-m	F-mp	E	M	
a		F-mp	F-mo	F-dp			a	
x							x	
i	D	F-do	F-do		C-d	D	i	
l							l	
l	C					C	l	
a							a	
	B		X	X		B		
	l					l		
	l					l		
M	2					2	M	
a							a	
n	C					C	n	
d							d	
i	D	F-do	F-do	F-do	C-d	D	i	
b							b	
l	E	F-oc	F-oc	F-mo	X	E	l	
e							e	
	6	F-oc	F-oc	F-oc	F-oc	6		
		S	H	H	S			
		Right			Left			

*C, carious; F, filled; m, mesial; d, distal; oc, occlusal; p, pit; X, missing.

TABLE 2 (CASE 2).—CARIES PICTURES OF M AND A*

		Right			Left			
		M	A	A	M			
	8	C-mp	†X	X	X	8		
	7	F-oc	C-m	F-oc	F-oc	7		
			F-oc					
M							M	
a	6	F-ocl	X	F-loc	X	6	a	
x				C-m			x	
i							i	
l	5	F-do		F-do		5	l	
l							l	
a	4			C-d		4	a	
	3		F-m			3		
	2	F-m				2		
	1	F-d	F-ml	F-m	F-d	1		
	1					1		
	2					2		
M							M	
a	3					3	a	
n							n	
d	4				F-mod	4	d	
i							i	
b	5		F-mo	F-do	F-mo	5	b	
l							l	
e	6	F-molb	F-mo	F-ocb	F-molb	6	e	
	7	F-oc	F-oc	F-oc	F-oc	7		
	8	X	X	X	X	8		
		M	A	A	M			
		Right			Left			

*C, carious; F, filled; m, mesial; d, distal; oc, occlusal; p, pit; l, lingual; b, buccal.
†Vestigial.

to be more susceptible to inhibiting or retarding influences than are other parts of the embryo. When anything slows down the life processes of the embryo, the organizer feels it first. Since it is the organizer that unifies or holds together the embryo, any interference with the organizer may let the embryo come apart, as it were, so that its two halves start to grow independently and give rise to two whole individuals.

This all might suggest an exact equality of monozygotic twins. However, this is not the case, since differences arise from intra-uterine complexities, unequal nutrition and inequality in somatic apportionment. And, too, the stage of development at which fission occurs also causes definite differences. Thus, the term "identical" with its meaning of "the same" or "exactly alike" can be applied here only very loosely.

To explain the question of somatic apportionment, let us employ the familiar terms of the microscope and suppose that dichotomy occurs from 12 o'clock to 5 o'clock. It is evident that the right half will have to regenerate more than the left half to achieve again the original form.

Human twinning has been known to occur from disunion of the blastomeres at as early as the two-cell stage. Jordan and Kindred[8] state that the phenomenon usually results either from fission of the blastoderm, plural gastrulation or fission of a later established embryonic axis.

Enzygotic twins from these stages suggest *per se* a very close general resemblance. Each twin would be a true duplicate of the other. If, however, development of the primary embryo has

TABLE 3 (CASE 3).—CARIES PICTURES OF JY AND JN*

		Right			Left			
		Jy	Jn	Jn	Jy			
	E	F-dp	F dp	F-dp	X	E		
M		C m	C-mo	F-mo				M
a								a
x	D		F-do	C-d	C-do	D		x
i								i
l	C				C-d	C		l
l								l
a	B					B		a
	A					A		
	A					A		
M								M
a	B					B		a
n								n
d	C	C-d		C-d	F-d	C		d
i								i
b	D	C-m		C-do	F-mo	D		b
l		C-d		F-mo				l
e								e
	E	X	F-oc	C-oc	C-m	E		
					F-oc			
		Jy	Jn	Jn	Jy			
		Right			Left			

*C, carious; F, filled; m, mesial; d, distal; oc, occlusal; p, pit.

TABLE 4 (CASE 4).—CARIES PICTURE OF A AND P*

		Right			Left			
		A	P	P	A			
	7	NIS	F-dp	NIS	C-mp	7		
					C-dp			
					C-d			
	6	C-mp	F-loc	C-loc	X	6		
M		C-dp						M
a								a
x	5				C-d	5		x
i								i
l	4		F-oc			4		l
l								l
a	3	Er		Er	Er	3		a
	2			C-lp		2		
	1					1		
	1					1		
	2					2		
M								M
a	3					3		a
n								n
d	4	NIS				4		d
i								i
b	5	NIS	NIS	NIS	NIS	5		b
l								l
e	6	F-dob	C-oc	X	F-oc	6		e
	7	NIS	NIS	C-oc	F-oc	7		
		A	P	P	A			
		Right			Left			

*C, carious; F, filled; NIS, not in situ; m, mesial; d, distal; oc, occlusal; p, pit; l, lingual; er, erupting; X, missing.

proceeded to the point where asymmetrical axial relations have been well established before the splitting occurs, each new part may acquire qualities which are not present in the other. These persist, and the twins will be less alike generally and will begin to show traces of inverse symmetry.

Simply, inverse symmetry is that condition in monozygotic twins wherein the right side of one twin compares with the left side of the other. This does not apply to all characters, but is evidenced in some. Newman[9] contends that mirror imaging is so closely related to polyembryony that it may be considered as a safe criterion for determining a monozygotic origin. This symmetry reversal manifests itself in the friction ridges or finger prints, palm and sole patterns, hair whorls and so on up through viscera and handedness.

According to Silverman[5]:

Newman assumes that dental arches fall somewhere between fingerprints and handedness, and if the deep-seated or superficial character of the primordium of the future dental arch is nearer that of palm pattern than it is to the handedness primordium, mirror-imaging in the denture would be of frequent occurrence in identical twins.

TABLE 5 (CASE 5).—CARIES PICTURE OF ED AND ER*

		Right			Left			
		Ed	Er	Er	Ed			
	6	F-mp	F-dp	F-oc	F-mp	6		
		F-dp	F-b		F-dg			
		C-b	C-mo		F-b			
M								M
a	5	E/	Er	C-oc	F-oc	5		a
x		F-dol						x
i								i
	4		Er			4		l
l								l
a	3	Er				3		a
	2			F-lp	F-lp	2		
	1		C-m			1		
	1					1		
	2					2		
M								M
a	3					3		a
n								n
d	4					4		d
i								i
b	5	E/		E/	C-oc	5		b
l		F-mod		F-mod				l
e	6							e
	6	F-mob	F-mob	F-mob	X	6		
		Ed	Er	Er	Ed			
		Right			Left			

*C, carious; F, filled; X, missing; E, second deciduous molar; er, erupting; m, mesial; d, distal, oc, occlusal; p, pit; l, lingual; b, buccal; g, groove.

TABLE 6 (CASE 6).—CARIES PICTURE OF W AND N*

		Right			Left			
		W	N	N	W			
	6	F-mp	C-do	C-m	F-mp	6		
		F-dp	C-dg		F-dp			
	E	F-mo	C-m	C-m	C-mo	E		
M			C-d	C-d				M
a								a
x	D	F-do	C-d	C-d	C-do	D		x
i								i
l	C					C		l
l								l
a	2					2		a
	1					1		
	1					1		
	2					2		
M								M
a	C					C		a
n								n
d	D	X	C-do		C-do	D		d
i								i
b	E	X	C-m	C-d	C-m	E		b
l			C-d					l
e								e
	6	C-m	F-oc	C-m		6		
		W	N	N	W			
		Right			Left			

*C, carious; F, filled; X, missing; m, mesial; d, distal; oc, occlusal; p, pit; g, groove.

Up to this point, we have considered the morphologic and physiologic development of monozygotic twins. Let us now take up the genetic phase of our problem. The groups under consideration are unique in that we have here individuals with the same hereditary mass exhibiting for the most part the same inherited characters, depending only on variation

in the amount of idioplasm distributed. These controlled manifestations can be compared with the manifestations of their environment. As Galton[10] says: "Twins have a special claim on our attention; it is that their history affords a means of distinguishing between the effects of tendencies received at birth and of those that were imposed by the special circumstances of their after-lives."

There are certain characters that persist against any environmental influence. Such a character is "hereditarily conditioned." If, however, a character is demonstrated only in a particular environment, it is "environmentally conditioned." Fingerprints are fixed at birth. They are hereditarily conditioned. Mental traits may be definitely influenced by environment. The psychologist has demonstrated this. Goldberg[2] suggests that the dental apparatus falls between these two points of influence. It will be one of my purposes to determine the extent to which either of these conditioners affects the teeth.

The factor providing for "these tendencies received at birth" is the genes, the units of heredity assumed to be contained in the chromosomes and providing for perpetuation of the race. All other cells are derived from the somatoplasm. "All strictly hereditary factors are determined at the time of conception and are transmitted only through the germ plasm." (Silverman.[5])

It was once thought that the character of the alveolar process was contributed by the mother and the character of the teeth by the father. Another erroneous idea was that the zygote actually contained the individual in miniature and increased in size until birth. Now we know that the zygote is a plan of the "ideal conditions," and, whatever its relation to the accepted normal, would be the optimum for that hereditary background.

The shape of the tooth and its pits and fissures, the form of the arch and the type of occlusion are all inherited characters. Goldberg[2] believes that heredity affects dental decay by influencing the shape of the tooth and the location of pits and fissures. He believes that smooth surface cavities evidence no play of

TABLE 7.—INDICES OF CORESEMBLANCE, CROSS RESEMBLANCE AND INTERNAL RESEMBLANCE FOR THE DENTITIONS OF SIX PAIRS OF MONOZYGOTIC TWINS

	Co-resemblance	Cross Resemblance	Internal Resemblance	
Case 1	0.87	0.75	0.75	S
			0.66	H
Case 2	0.5	0.59	0.62	M
			0.5	A
Case 3	0.4	0.65	0.4	Jy
			0.7	Jn
Case 4	0.64	0.64	0.57	A
			0.57	P
Case 5	0.70	0.62	0.66	Ed
			0.58	Er
Case 6	0.5	0.58	0.75	W
			0.66	N

TABLE 8.—INDICES OF CORESEMBLANCE, CROSS RESEMBLANCE AND INTERNAL RESEMBLANCE FOR PIT AND FISSURE AND SMOOTH SURFACE INVOLVEMENTS OF THE POSTERIOR TEETH OF SIX PAIRS OF MONOZYGOTIC TWINS

	Co-resemblance		Cross Resemblance		Internal Resemblance		
	P and F	Smooth	P and F	Smooth	P and F	Smooth	
1	0.81	0.91	0.56	0.79	0.5	0.75	S
					0.62	0.82	H
2	0.93	0.59	0.93	0.77	1.0	0.62	M
					0.87	0.56	A
3	0.9	0.5	0.9	0.62	0.8	0.5	Jy
					1.0	0.75	Jn
4	0.75	0.77	0.75	0.84	0.7	0.68	A
					0.7	0.87	P
5	0.9	0.87	0.9	0.87	1.0	0.88	Ed
					0.8	0.88	Er
6	0.62	0.54	0.68	0.70	0.75	0.75	W
					0.93	0.66	N

heredity upon them. Korkhaus,[1] however, believes that smooth surface susceptibility can be inherited. The point still can hardly be settled. Keeping in mind that caries has its incipiency in the enamel adjacent to the food plaques held in the pits and fissures and interproximal spaces, the presence of caries would in some part at least depend on the ability of prophylactic measures to remove these plaques. Yet it is difficult to discount the fact that the size and shape of the jaw and teeth are inherited. If the process so accommodates the teeth that there are spaces between them, this precluding caries, or if the size and shape are such that there are tight contacts, crowding, etc., certainly offering a good site for decay, there is a powerful suggestion of hereditary influence here too.

CASES

The cases presented, in all but one instance, were those of regular patients at the Forsyth Dental Infirmary for Children. These children were determined, as nearly as is possible, to be monozygotic twins. Bachrach and Young[2] use only the criterion of the striking effect of their similarity on the observer. So, too, in these cases, the twins were subjected to a careful scrutiny, by me and by several of my colleagues, and had to present difficulty in differentiation to be included in the study. An attempt was made to supplement the physical similarity with an inquiry to the parent as to the nature of the birth and the time elapsed between delivery of the twins. A common placenta or chorion had been considered as indicative of monozygotic twinning. However, this theory has been disproved by Newman,[7] who finds that if fission occurs early, the embryos may organize their own fetal membranes and their own placentae, and develop independently of and separately from each other. A short space of time between the deliveries would suggest also a common placenta.

The teeth were carefully examined with a hand mirror, a No. 7 explorer and air syringe. Notation of the condition of each tooth was made.

The color of the eyes, the color of the hair, the direction of the hair whorls and the handedness were also carefully noted. To be included in this study, each set of twins had to have hair and eyes of the same color. The hair whorls were observed in most sets. The normal whorl is from left to right. Deviations from this were noted.

The handedness of each individual was determined with as much accuracy as possible. In addition to questioning, each subject was asked to write his name. Then, in an effort to see whether the writing reflex had been conditioned rather than determined by heredity, each twin was asked to perform some other normal manual function, such as throwing an object. One twin used his left hand, even though, as had been observed, he wrote with his right hand. Questioning proved that he did everything with his left hand but write. He might be considered truly left-handed.

Newman considers predilection for chewing on the right or the left side as an inherited tendency associated with handedness. The subjects were questioned as to their chewing habit. Little satisfaction was obtained, for few could give a dependable answer. Too, a false note might easily enter here, for the selection of the chewing side may be governed by pathologic conditions on the other side.

HISTORIES

There follows now a study of the caries picture of six pairs of monozygotic twins (four female, two male, ranging in age from 5 to 23). These six sets survived an eliminating process from twenty sets under consideration. This group above everything else showed a very marked resemblance of the twins. In addition, there was some manifestation

of inverse symmetry either in the hair whorl, the handedness or the caries picture.

There was no attempt to arrive at statistical conclusions: there was too much variation in the ages. The dentitions were not constant in each set. Each pair of twins, while exhibiting highly interesting dental characteristics, fell too little around a norm. Thus, indices were arrived at for the individual pairs, rather than figures that would be indicative for a group.

All involvements were considered with an eye to the final dental picture. Thus, caries on the distal surface will of necessity mean a filling on the distoclusal surface after operative work. Thus, two-surface fillings were considered to have their origin on the smooth surface. Here the occlusal surface is but passively involved.

An index for coresemblance (the similarity of the same side in each cotwin), cross-resemblance (the similarity of the right side of one twin with the left side of the other and vice versa) and internal resemblance (the similarity of the right and left side in each individual or the tendency to bilaterality) was arrived at for each twin. The index was a ratio of the number of teeth with similar conditions to the number of teeth in the mouth.

REPORT OF CASES

CASE 1.—S and H, girls, aged 7, both have brown eyes and brown hair. H is older, but S is taller, heavier, more aggressive. Both are of fine temperament. They are both right-handed. The hair whorls demonstrate inverse symmetry (in H, clockwise; in S, counterclockwise).

S had twenty-one involved surfaces; H, seventeen. From Table 1, it can be seen that there was a greater tendency to simulate each other's condition in the same quadrant than to show even the expected bilaterality.

An examination of the findings in the maxilla show a more advanced stage of involvement in both girls on the right side than on the left. Palmer, Klein and Kramer[11] state that, in the normal individual of a single birth, "thus far it has not been shown that there are significant differences between the time of eruption of corresponding teeth." Knutson and Klein[12] state further that the "attack of teeth by caries may be, in part, a function of the length of time individual teeth are exposed in the mouth after eruption." These factors seem to suggest that there was a discrepancy in the rate and sequence of eruption on the left side for each twin; which further suggests that this similarity must be due to some other condition, such as heredity. Certainly the time of eruption is hereditarily conditioned.

There was significant coresemblance on the right upper, right and left lower quadrants.

The index of coresemblance was 0.87, as opposed to an index of 0.75 for cross resemblance.

CASE 2.—M and A, boys, aged 23, have black hair and brown eyes. M is the older by fifteen minutes and is taller, but A weighs more. A is definitely more aggressive than M. Both had measles at the age of 5. Both are right-handed. The hair whorls are similar, counterclockwise.

M had thirty-two surfaces; A, thirty-four.

A study of Table 2 affords definite evidence of mirror-imaging in the upper arch. The second premolar and first and second molars are involved. The right first molar has been lost in A; the left first molar, in M. In each case, the second molar has drifted mesially to come in contact with the second premolar.

These twins show an index of cross resemblance of 0.59 as compared to a coresemblance of 0.5. This might be considered too close to prove a point. Yet it must be remembered that inverse symmetry does not affect all characters, only a few.

CASE 3.—Jy and Jn, girls, aged 5, have greenish brown eyes and light brown hair. Jy is older by three hours, weighs more and is more aggressive. The birth was premature at seven and a half months. The general appearance is good. The hair whorls are counterclockwise in both. Both are right-handed.

Jy had twenty-six involved tooth surfaces; Jn, sixteen.

In this set too, there are definite manifestations of mirror-imaging as demonstrated in the posterior teeth of each arch.

The index of cross resemblance was 0.65, as compared with a coresemblance of 0.4.

CASE 4.—A and P, boys, aged 12, have greenish blue eyes and brown hair. A is older by two hours. P is taller and heavier. A is left handed; P, right handed.

A had twenty-one involved tooth surfaces; P, sixteen.

Again inverse symmetry is disclosed in the upper second molars and the lower first molars.

Both cross resemblance and coresemblance give an index of 0.64. Here, there was a slightly greater tendency for twin resemblance than for internal resemblance.

CASE 5.—Ed and Er, girls, aged 11, have blue eyes and black hair. Both have freckles. Ed is the older; Er, taller and heavier. Both are right-handed. The hair whorls are opposite (Ed, clockwise, Er, counterclockwise).

Ed had twenty-four involved tooth surfaces; Er, nineteen.

The second deciduous molars was still *in situ* on the right in one and on the left in the other twin.

There is a greater tendency for coresemblance, with an index of 0.7, than for cross resemblance, with an index of 0.62.

CASE 6.—W and N, girls, aged 8, have brown hair and brown eyes. W is the older by fifteen minutes and is also taller and heavier. W has a speech impediment, which is beginning to show improvement. W relies on N. N has freckles; W is fair. They had the same childhood diseases at the same time. They are both right-handed. Delivery showed a common placenta.

W had thirty-six involved tooth surfaces; N, twenty-five.

In this duo, there is greater leaning toward internal resemblance than toward cotwin resemblance.

RESULTS AND DISCUSSION

All these findings lead to some interesting conclusions. It is rather evident that, in several sets, truly duplicate conditions were found in the caries picture. In other sets, the phenomenon of inverse symmetry was readily discernible. The expected tendency toward internal resemblance or bilaterality, although not strong, was found to be about even in each member of a pair.

These manifestations seem to be too definite in form to have just happened. From our previous discussion, there seems to be a well-appointed reason. Perhaps a genetic consideration will add additional light.

If the genes give us the best plan of the individual, we should expect to find a common best plan in twins. Therefore, with heredity fixed and only environment variable, we would expect a very similar caries picture, influenced only by a propensity to coresemblance or cross resemblance.

If we have a perfect agreement between the characteristics of two individuals, the ratio between them, or the index, would be 1. As differences come into play, the ratio becomes less than one and the degree of similarity is indicated by the proximity of the index to 1 or 0.

Let us assume that in twins the heredity, or H, is fixed and the environment, or E, is the same for each. This would give us a perfect comparison and a ratio, or index, of 1. E, however, cannot be considered as similar for each. Therefore, it is E that is going to bring about changes in the index, and the smaller the index, the greater has been the effect of environment.

With Goldberg's[2] contention on the cause of pit and fissure and smooth surface cavities in mind, an inquiry into the question was conducted on these groups. To consider only the teeth with pits and fissures, that is the premolars, the permanent molars and the deciduous molars, the coresemblance, the cross resemblance and the internal resemblance indices were determined for pit and fissure similarities and for smooth surface similarities.

The permanent molars and second deciduous molars were considered as presenting two occlusal surfaces to decay (one the mesial pit; the other, the distal pit). Each of these teeth had four smooth surfaces, but only two surfaces were approximal, and only the latter two were

considered. Thus, the pit and fissure index was a ratio of the number of similar pit and fissure conditions to the number of pit and fissure surfaces presented, and the smooth surface index was a ratio of the number of similar smooth surface conditions to the number of smooth surfaces presented.

If the index for one was less than the index for the other, from what has been mentioned before it was assumed that it was environment that caused the deviation. Now since we are giving attention to each condition in the same teeth, we can determine which has exerted the greater influence on these teeth, H or E.

To consider each set of twins individually: Case 2 and 3, for instance, show a greater index for pit and fissure similarity than for smooth surface similarity; which would imply that environment was the cause of the dissimilarity and thus the cause of the caries. In Case 1, however, there are opposed findings. The smooth surface cavities are influenced by heredity, while the pit and fissure cavities are affected by the environment.

It has been noted that the first born of a twin birth often showed a disturbing history. The general physical and mental bearing of the one individual seemed to be below that of the other. There were more childhood diseases, more teaching problems, more social problems. A question arose as to whether this general debility would be manifested in the dentition. An average of four more involved surfaces were disclosed by the first born. This slight propensity to increased susceptibility might be associated with the trials and tribulations of being the first to be delivered.

An interesting speculation is afforded by contemplating the problem of handedness. As previously cited, handedness is an epithelial character. Inverse symmetry often denotes itself by opposite handedness. Spemann[18] states that when there is fission performed at the beginning of gastrulation, a regulation toward the whole takes place, "but it is, so to speak, overtaken by the advancing development, and thus, the twin embryos develop a weaker formation of the inner side." This gives dominance to the outer sides of the twin embryos. It is on the outer sides that the handedness primordium arises. Silverman[5] believes there is a "physiologic superiority" to the outer side.

Now we know that the enamel is ectodermal in origin, being derived from the same layer that institutes the process of twinning and that presents the handedness primordium. Could we not, therefore, deduce that, if the outer sides of twins are the superior dominant elements, as evidenced by handedness, etc., the enamel on the outer sides also will have a physiologic superiority over the inner sides? Thus, since decay begins in the enamel, could we not further expect a dominance or greater resistance to decay on the outer or handed side and a similar susceptibility to decay on the inner sides?

The paucity of material here would hardly allow even a tentative conclusion. Further study on large numbers is definitely indicated.

It is interesting to note that such studies may easily be conducted by surveying left-handed individuals. Lauterbach[14] believes that the fundamental causes of twinning and left handedness are the same. He states that in a left-handed individual of a single birth, there had been a biaxial organization for twinning, with suppression of the right axis leaving the surviving left axis dominant. Thus, the findings on these individuals can offer the same quality of statistics as those derived from twins. This is work for the future.

There is one factor which seems to have evaded the researchers on the problem; that is, that the writing center for either hand is on the opposite side of the brain. This would indicate that per-

haps the theory should be reversed. This problem is left to Newman as entirely out of the realm of this paper.

SUMMARY

The caries picture in six pairs of monozygotic twins was studied. Definite tendencies to coresemblance and cross resemblance were manifested in the dentitions.

Heredity and environment are the two conditions which influence the function of an individual. In this study, heredity was a fixed quantity for each pair and so it was possible to study and measure the impact of environment on each co-twin.

The handed side of a co-twin is considered to be a manifestation of the physiologic dominance of that side. The speculation arises as to whether we can expect an enamel superiority or caries immunity on the superior, handed side.

CONCLUSION

This is hardly the final word on the question of the relation of heredity and caries, yet it is only in studies of monozygotic twins that we shall find the real answer to the relative effects of heredity and environment on dental caries.

This is only a preliminary study, for the subject has proved itself fascinating enough to encourage me to delve farther into its mysteries.

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MUCOSTATIC IMPRESSIONS

PAUL I. ADDISON, D.D.S., New York, N. Y.

TO function successfully, dentures must have stability, balanced occlusion and retention. These factors in function are recited in the order of their importance, although, as is understood, balanced occlusion would be valueless without retention. In a successful denture, therefore, it must be recognized that these three factors are inseparably and independently necessary.

What is stability? Stability is the ability of the denture, under crushing functional loads, to resist displacing movement in any direction other than the path of insertion. In other words, a stable denture is one that is firm and steady on its base (the tissues) during crushing functional loads.

Although the subject of balanced occlusion is outside the scope of this statement, its necessity is acknowledged here.

The third requisite, retention, is commonly termed suction. It is, in reality, the ability of a denture base to resist dislodgment only in a path opposite to that of its insertion. It complements and usually accompanies stability.

ANATOMIC CONSIDERATIONS

The mucostatic theory is particularly applicable to lower dentures. The edentulous mandible may be likened to an inverted U-shaped or V-shaped rock covered with a dense, compact mass of sphagnum moss and projecting from a turbulent sea. Just as the rock has its high water mark above which the most turbulent sea never rises and its low water mark below which the serenest sea never settles, the mandible has an aloof area above the lingual, buccal and labial muscle attachments in which no movement occurs during function. There are no muscle attachments on the ridge, but there are frequently several tendinous attachments. As we are interested in the function of the finished denture rather than dramatics or acrobatics, the success of the denture will not be determined by grasping the cheek or lip and pulling it mightily in any direction to see how close to the ridge summit a tendinous attachment will go. These cords are very active during function. However, the ridge connection of these cords lies in the periosteum, and they do not, therefore, disturb the ridge mucosa during function.

Lingually, there are the mylohyoid ridge, the internal oblique ridge and the genial tubercles; distally, the retromolar pad and the insertion of the pterygomandibular raphe, and, buccally, the external oblique ridge and the *crista buccinatoria* for attaching the buccinator muscle and the bony attachments for the platysma. *M. triangularis* and *M. quadratus labii inferioris* are either at the level of or below the mental foramen. Labially are the bony attachments for the *M. incisivus labii inferioris* and *M. mentalis*. Above all this, we have calm. When excessive alveolar atrophy has occurred, it might be preferable to say that between the external and internal surfaces of the mandible, we have calm. In short, then, for the purposes of denture construction, all load bearing surfaces might be said to have "static" tissue.

DEFINITION OF "MUCOSTATIC IMPRESSION"

In a mucostatic impression, there is

registered all of the tissue area which rests on the mandible proper and above or below all the tissue area described as movable during normal function. This tissue area must be recorded exactly, without impingement upon the musculature or tissues unsupported by bone. An impression, and subsequently a denture base, must be produced that is an absolutely accurate negative of the ridge tissues in their normal passive form. There must be an accurate recording of those functionally motionless (static) mucous ridge tissues.

HYDROSTATICS AS THE FOUNDATION FOR THE MUCOSTATIC TECHNIC

In order to understand the principle of mucostatics, it will be necessary that we lay aside prejudices acquired in our previous education. An article by an authority on dentures in a recent journal contained the contradictory statement that atmospheric pressure produced by the creation of a partial vacuum under dentures and its maintenance by means of a peripheral seal was the chief factor in the retention of dentures. Then the writer noted the retentive factors of saliva under dentures, adhesion and cohesion. To accomplish retention, he urges the patient to suck air from beneath the denture and allow the saliva to take its place. How can the authority in question justify the existence of a peripheral seal and, at the same time, show how to cause air to make egress and saliva to make ingress freely across the peripheral seal borders? What would happen to his "vacuum" and his theory of atmospheric pressure retention once the "vacuum" were displaced by saliva?

We know that Nature abhors a vacuum. Physiologists testify to the effect of a vacuum on tissues. The tissues will be irritated until the vacuum is removed. Every dentist has noticed this irritation of tissues under loosely fitted dentures. What, then, accounts for the retention of dentures? It is surface tension or, more properly, interfacial surface tension. Any one who has tried to lift a flat board directly from the surface of a lake will recall the power of surface tension. If we take two moistened glass slabs, place them together and attempt to separate them at right angles to each other, we demonstrate this powerful natural force. To those who contend that atmospheric pressure holds these slabs of glass together, this experiment is suggested: Moisten two slabs of glass with an even, unbroken film of water, place the slabs suspended in a vacuum chamber and exhaust the air. The slabs continue to adhere to each other. Upon

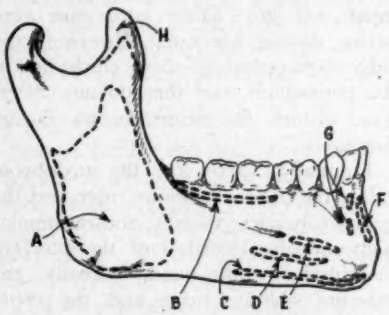

Fig. 1.—A, M. masseter; B, M. buccinator; C, Platysma; D, M. triangularis; E, M. quadratus labii inferioris; F, M. mentalis; G, M. incisivus labii inferioris; H, M. temporalis.

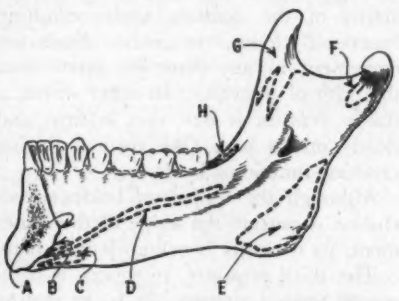

Fig. 2.—A, M. genioglossus; B, M. geniohyoideus; C, M. digastricus; D, M. mylohyoideus; E, M. pterygoideus internus; F., M. pterygoideus externus; G, M. temporalis; H, M. buccinator.

removal from the vacuum chamber, the slabs will be even more firmly adherent. The moisture between the plates will have been drawn out and the moisture film considerably thinned. The thinner the film of moisture, the greater the force of surface tension. Surface tension is inversely proportional to the thickness of the moisture film. The retention of dentures constructed by any method is the result of interfacial surface tension.

Stability has previously been defined as the ability of the denture to remain firm and steady on its base, the tissues, under functional loads. Any discussion of stability will inevitably include the so-called compression of soft tissues.

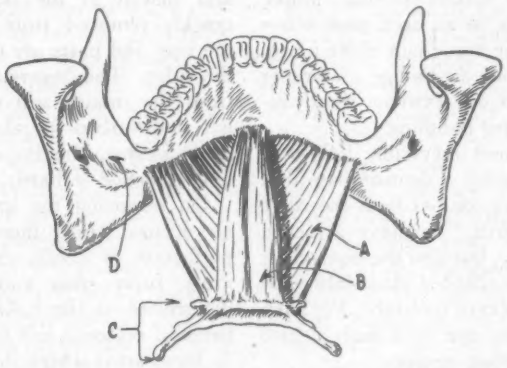

Fig. 3.—A, M. mylohyoideus; B, M. geniohyoideus; C, Os hyoideum; D, Ramus mandibulae.

Here again, we learn from physiology. Physiology states that tissue is composed of two main components, water and solids. Science has known for centuries that water and solids cannot be compressed except under extreme pressure. The predominant and by far the more compressible component of soft tissue is water. The solid components in soft tissues are much less compressible. If we compute by means of available tables the amount of pressure required to reduce, even infinitesimally, the tissue area of the average mandible, we find that we must exert an over-all pressure that is the equivalent of many tons. The change that we observe in tissues under stress cannot then be "compression." It is distortion. It is displacement. The term "compression" as applied to impression technics should therefore be discarded.

Consider ridge tissue in terms of its simplest component, water. Three hundred years ago, a Frenchman named Pascal proved that pressure exerted upon confined liquid is transmitted undiminished in all directions. He proved that this liquid exerts an internal counterpressure equal to the outside pressure exerted upon it. Any one who has attempted to inject procaine through a completely clogged needle will understand this. The column of solution in the barrel of the syringe is as rigid as a steel bar. Oftentimes, the glass will shatter before the plunger will descend even so much as a millimicron. Ridge tissue, which is a semisolid and subject to the same hydrostatic laws as water, reacts in much the same way as a liquid confined in a closed vehicle.

APPLICATION OF THE LAWS OF HYDROSTATICS TO SOFT TISSUE

On the mandibular ridge, we have an elastic, static, semisolid, incompressible mass of periosteal, connective, submucous and mucous tissue. This tissue is based solidly on bone extending to

those points buccally, labially and lingually constituting the muscle attachments. From these points, the tissue is unsupported, a labile, effluent mass. Tissue is a semisolid and subject to the same hydrostatic laws as a liquid. No amount of pressure at any point on the denture base will allow movement because the tissue has assumed the rigidity of its container, the denture base.

Fortunately, for our purposes, ridge tissue is not a liquid, but an elastic semisolid. It cannot flow out from that thin area between the edge of the denture base and the bone, but merely supplements its rôle as the contained substance by also completing the closed system. It has integrity of substance and motion. The whole tissue in an area must move or no part of the tissue can move at all. This works to our advantage on proper handling and to our extreme disadvantage with improper handling.

Retention almost inevitably follows if we have constructed a denture base that maintains perfect contact with the ridge tissue at all points. We have achieved not only stability, but also the equivalent of two perfectly adapted glass slabs with an intervening film of moisture. We have perfect retention, due to a high degree of interfacial surface tension.

As the alveolar ridge cannot be forced to fit into a closed container, without striving to regain normal position and thus unseating the appliance, we must build a container that will be perfectly adapted to the tissues themselves. We must obtain a negative recording of these ridge tissues in their natural undistorted position.

PROCEDURES

A tray that will loosely fit the ridge without impingement on any musculature whatsoever is selected. If the impression material could be conveyed to the mouth without a tray, conditions would be much better served. Experience has shown that Ackerman's impression cement, a powder and liquid eugenol, is the most manageable and accurate material, and not distortable when set. When thoroughly spatulated, it is a smooth, creamy mix, softer than the softest tissue that is commonly encountered.

During the mixing of the cement, a double fold of gauze is placed on the mandible. Since a thick film of moisture between the ridge and the denture would destroy stability and retention, gauze is used to remove all the excess saliva. The patient is cautioned to relax completely. He must not grimace, open the mouth wide or otherwise distort the facial musculature. When the paste is spatulated and placed in the tray, the gauze is quickly removed from the mouth and the tray and paste are gently inserted on the ridge. The fingers are then removed from the mouth and the impression is left undisturbed for about two minutes. At this time, the impression paste will have reached a hard, undistortable set.

On removing the impression, if it is an accurate one, there will be a fine perfection of detail, crevices, smoothed areas, fuzzy areas and tiny ridges not discernible to the naked eye. The impression material will have flowed down to those areas where the natural folds of the mouth exist and no farther. Often, the impression will end with a knife-edge margin where the lip and cheek turn abruptly from the mandibular attachments.

Any impression material covering movable muscle tissue is removed with a sharp knife or scissors. If the impression was taken without pressure on the tray during the setting of the paste, without muscle impingement at any point, without tray impingement and with the paste softer than the softest tissue, the impression will have remarkable stability and retention on test. So strong will be this retention that the entire lingual flange can be removed without affecting the stability of the impression in any

way. The impression will represent a container that properly encloses its tissue with an equal pressure and counter-pressure at every point.

Such accurate impressions would be useless if a denture of the same accuracy could not be reproduced. Ticonium has proved most accurate for the denture base.

SUCCESS AND FAILURES WITH "COMPRESSION" AND "MUSCLE TRIM" METHODS OF DENTURE CONSTRUCTION

If we believe that "compression," "functional tissue position," "atmospheric pressure" and "peripheral seal" are untenable theories, some will ask how we can explain the fact that so many dentures constructed in the past have fairly well or completely met the requirements of stability and retention. The answer is fairly simple: They have been constructed in accordance with the basic concepts of the mucostatic principles. Ridges vary greatly in size and texture. It is not difficult to conceive that a prominent ridge covered with tight dense tissue is almost as undistortable under stiff modeling compound as it is under a soft zinc oxide-eugenol paste. In short, if we wish to take an impression of a steel disk, it matters not whether we force modeling compound on its surface or pour soup that will set on its surface; the resulting impression will be the same, and it will be accurate.

Extensively resorbed alveolar bone and loose, flabby overlying tissue present a different problem. If, for an impression material, a modeling compound or a paste stiffer than the softest tissue, or plaster which is "dead" and causes a drag on soft tissue, is used, an impression is obtained which has pushed the tissue out of the way and has settled on the harder areas. Tissue, being an elastic substance, constantly endeavors to return to its natural position. Tissue, being a vital substance, is subject to changes in form under unnatural pressure. If an impression is obtained with a harsh material that does establish perfect contact at all points, the tissue, in its attempt to return to its natural position, will either unseat the impression or undergo pressure atrophy. Usually, both of these processes will go on at many points of the denture-bearing area, and these in turn will be constantly shifting, in accordance with the tissue tone at that particular point. This phenomenon is commonly regarded as "settling" of the denture. If the process is rapid, as it often is, there is, in addition to loss of retention and stability, loss of vertical dimension and complete disruption of occlusion.

Muscle trim and deep buccal and lingual flanges are hindrances. Since it has been shown that they are not needed to exclude air and, resting as they do on completely unsupported soft tissue, they do not serve as support, their chief accomplishment has been to annoy the patient and encourage distortion of the bone-supported ridge tissues by a constant downward drag. A short lingual flange, with just sufficient depth to stop lateral motion, is all that is required to prevent horizontal movement of the denture.

In view of the hydrostatic principles by which dentures are retained and stabilized, it is physiologically inadvisable to attempt to force tissues to conform to a denture base that is arbitrary in design. We may get "the closed container," but we cannot long maintain it.

CONCLUSION

The profession has been offered a scientific theory for the construction of full lower dentures and a more logical approach to the handling of any bone based soft tissues intended to support prosthetic appliances. In observing dentures that I constructed three and a half years ago, the same stability and retention present on their insertion were

noted. Atrophy seems to have been completely discouraged by the perfection of fit and the over-all evenness of pressure and counterpressure. The gentle intermittent pressure during function and non-function has maintained the ridge in prime condition, free from any evidence of chronic irritation.

The accuracy of the impression technic when properly applied has been convincingly demonstrated by producing a succession of casts identical in every detail from different impressions of the same mandible.

It seems evident to me that Mr. Harry Page, the originator of mucostatics, has presented a wholly practical theory and a method for its application in the construction of prostheses for edentulous mandibles. In a narrow sense, it is fortunate that this information could not have originated within our own ranks. In a large sense, it matters not whence progress is made, it matters only that it is made. It is neither the first nor the last time that the healing profession will have learned from the uninitiated.

654 Madison Avenue.

CLINICAL PATHOLOGY OF IMPACTED THIRD MANDIBULAR MOLARS

MAXWELL EDWARD STONE, D.D.S., Bloomfield, N. J.

INTRODUCTION

IT is well known to the profession in general that impacted teeth are conducive to pathologic conditions, which are evident, in many cases, only after a considerable area of the adjacent tissues has been destroyed or some more important structures have become involved.

Since the third mandibular molar is more frequently impacted than other teeth, this paper is devoted entirely to the clinical manifestations of this anomaly.

DEFINITION

An impacted tooth is one that lies against the adjacent teeth or hard substances and is thus prevented from its normal eruption. Impaction means the abnormal contact of one tooth with another, but the tooth may be completely or partially covered by bone.

ETIOLOGY

Despite their number, the theories advanced as to the possible causes of impaction seem inadequate to cover the varied conditions arising from this abnormality. The outstanding etiologic factors can be classed under two headings: local and general.

Local.—The local factors are:

1. Irregularity in the position and pressure of an adjacent tooth.

2. Undue trauma, causing a deposition of lime salts in the cancellous tissue.

3. Inflammation of the intra-alveolar periosteum extending into the alveolar process, causing a local increase in the density of the bone, the cancellated tissue thus becoming hard and solid instead of being spongy and elastic. As a result of this undue hardening of bone before the tooth has completely erupted, the latter becomes encased in the surrounding osseous tissue and there is not sufficient eruptive force to bring it through the tissues and into its proper position. Naturally, it will assume a position in the line of least resistance until the bone

has been resorbed, after which it will appear in an abnormal position.

4. Lack of space, due to underdevelopment of the jaws.

5. Contraction of the arches, due to mouth-breathing.

6. Unduly long retention of the deciduous teeth.

7. Premature loss of the deciduous teeth.

General.—The general factors are:

1. The acute infectious diseases of childhood: scarlet fever, measles, etc.

2. Inheritance of a small arch from one parent and large teeth from the other.

3. Syphilis.

4. Tuberculosis.

5. Miscegenation.

6. Anemia.

7. Disorders of nutrition: rickets, scurvy.

ABNORMAL POSITIONS OF IMPACTED LOWER THIRD MOLARS

1. The tooth lies in a horizontal position. In the development of the mandible, the first permanent molar is developed in the body of the bone about the sixth year, a little anteriorly from the ramus. As the body of the mandible lengthens, the second molar also appears, just posteriorly from the first, and in front of the ramus. The body lengthening still more in its growth, the third molar erupts posteriorly from the second, and directly in front of the ramus. If, however, the body of the mandible fails to lengthen sufficiently, because of any of the etiologic factors previously mentioned, to permit the normal eruption of the third molar, it may take a position with its occluding surface directly in contact with the distal surface of the second molar, while its roots extend backward into the ramus of the mandible. The tooth thus lies in a horizontal position, parallel, or nearly so, to the lower border of the jaw.

2. The crown of the tooth is inclined toward the anterior border of the ascending ramus.

3. The crown of the tooth is inclined toward the lingual aspect.

4. The crown of the tooth is inclined toward the buccal aspect.

5. The tooth is situated vertically.

LOCAL SYMPTOMS

An impacted tooth may lie dormant, the condition presenting no outstanding symptoms. Other impactions may cause pain, which may be local or neuralgic.

1. The tissue overlying an impacted third mandibular molar may be swollen and tender from being bitten upon by the occluding tooth in the opposing jaw.

(a) If the tissues about an impacted third mandibular molar are severely inflamed and can be readily lifted away from the tooth, a deep pocket, which may vary in its location, depending on the type of impaction, can easily be detected.

(b) Fluid or cheesy pus may exude from beneath the flap.

2. Spasmodic contraction of the muscles of mastication may result from direct nerve irritation.

3. Swelling may be confined to the tissues in the region of the angle of the jaw, or may include the parotid and submaxillary structures also.

4. If the early evidence of impaction is ignored, the condition advances quickly, very definite symptoms being manifested.

(a) There is a general systemic depression accompanied by a fever, which tends to make the patient feel very sick.

(b) Trismus results, owing to involvement of the buccal, lingual and tonsillar tissues.

(c) If the throat is involved, there is difficulty in swallowing.

(d) The glands on the affected side are palpable and tender.

DIAGNOSIS

1. In order to make a proper diag-

nosis, it is essential to have a complete history of the case.

2. A complete clinical examination of the oral cavity is made, noting the number of teeth present and the absence of any permanent teeth.

3. The x-rays are valuable not only in detecting the presence of an impacted tooth, but also in accurately locating it and determining the shape and position of the crown and roots and the relation to the adjoining teeth.

The roentgenogram acts as a means of differential diagnosis in the case of the lower third molar, excluding mumps, submaxillary or parotid inflammation from other causes, pytalism, tumors, true ankylosis and other infectious diseases.

Again we emphasize the fact that the presence of the tooth is the determining factor and the x-rays the final means of decision, other diagnostic efforts having failed. To conclude: Diagnosis of an impacted lower third molar should include an extra-oral roentgenogram of the entire side of the mandible, as well as small intra-oral films (taken wherever possible) for detail.

TREATMENT

Having made the diagnosis, the operator determines the correct procedure. I shall not enter into a detailed discussion concerning the method of removing an impacted third mandibular molar, but merely outline the surgical technic.

1. The local or general anesthetic is selected to fit the case.

2. Injection of an anesthetic solution into an area where there is a possibility of forcing some purulent material into deeper healthy tissues is avoided.

3. The operating field is sterilized.

4. Trauma is avoided as nearly as possible.

5. Laceration of the soft tissue is avoided.

6. Only the necessary amount of bone tissue is cut away.

7. By a skilful operative technic, excessive hemorrhage during the operation is avoided.

8. Both surgical and mechanical shock is eliminated as nearly as possible.

9. Surgical asepsis is maintained throughout the operation.

10. In the postoperative treatment, care is observed to avoid severe infections.

11. Dressings may be used to secure drainage, to prevent reinfection and to control hemorrhage.

Patients suffering from acute inflammatory conditions due to impaction of a third mandibular molar frequently come in for treatment in a state of great distress from pain, inability to open the mouth and associated symptoms of local disturbances, together with a rise in temperature and other general indications of the toxic influences of the infection.

Although it may be apparent that the offending tooth must be removed, the decision as to the time of extraction is a matter of importance. At this point, it is necessary to remember that the physical condition of the patient is also a vital consideration.

Extreme complications and even death have been reported from operation during the acute inflammatory stage. It is a much wiser and safer plan to await the subsidence of the acute symptoms before undertaking the removal of an impacted tooth.

Palliative treatment for the local inflammation should be the first step. The most important factor in this treatment is the establishment of drainage and thorough washing of the parts with an antiseptic solution.

In urgent cases, when such a procedure is not practicable because of the danger from continued progress of the inflammation and infection, drastic measures may be absolutely necessary.

A mouth gag can be used to force the mouth open. With the mouth opened, it is possible to reach the seat of the inflammation to draw off the pus from the

area over and around the impacted tooth, to disinfect the mouth and to make local applications both intra-orally and extra-orally for the relief of the inflammation. After this treatment, the extraction of the tooth may be carried out with a greater degree of safety.

COMPLICATIONS ARISING FROM THE IMPACTION OF MANDIBULAR THIRD MOLARS

The impaction of lower third molars may cause a great variety of disturbances locally and generally. The complications may be considered under three distinct headings: 1. Inflammation of the overlying soft tissues. 2. Neuralgic disturbances. 3. Inflammatory reactions of the hard tissues.

Inflammation of the Overlying Soft Tissues.—One of the most common disturbances arising from impaction of a lower third molar is inflammation of the soft tissues covering the crown of the tooth. This may be caused by pressure and irritation (1) from the opposing teeth from above or (b) from cusps of the impacted tooth underneath.

The mucous membrane becomes highly inflamed, greatly swollen, tender to touch and rather painful. Pockets often form between the crown of the tooth and the overlying mucoperiosteum, which, upon continued irritation, becomes infected by the micro-organisms of the oral cavity. This condition continues, undisturbed by the toothbrush, because of the awkward position.

The presence of the micro-organisms, under these favorable conditions, soon results in infection.

In fact, Vincent's infection, or trench mouth, frequently has its origin in the lower third molar region, owing to the fact that the location is favorable for incubation of the spirochete and fusiform bacillus.

Suppuration frequently ensues from an infected pocket, and a pericoronal abscess is established. This abscess may be acute or may pass into a chronic stage with periodical acute exacerbation, the pus escaping about the edges of the pocket. When suppuration ensues, the pus does not always remain localized, but may burrow into the submaxillary triangle. This often results in a severe abscess, diffuse cellulitis involving the entire angle of the jaw; or it may point, causing a peritonsillar abscess. The extension of the inflammation in this manner greatly interferes with deglutition. In the early stages of inflammation, trismus may be present.

Inflammation arising from impaction of a lower third molar may readily extend to the lymph channels of the neck and lead to pyemia, septicemia and other disturbances of the blood and lymphatic systems. The final result may be grave or slight, according to the resistance of the individual and other conditions on which the prognosis must depend in all such affections.

Neuralgic Disturbances.—The mechanism of neuralgic phenomena is obscure. It is probable that, owing to the incorrect position of the tooth, the nerve supply of the tooth proper is irritated, or the circumferential pressure in the bone surrounding the impacted tooth may cause the pain.

1. Obscure headaches may result from pressure of the impacted tooth on the vessels and nerves in the region.

2. Severe odontalgia in one of the nerve plexuses in the region may be caused by the presence of the tooth, the pain being reflected to other teeth.

3. Insanity, hysteria and melancholia arising from the pressure irritation exerted by the impacted tooth may be of such intensity that it is transmitted to the higher brain centers.

There are many reports of cure of or benefit in these conditions from removal of impacted lower third mandibular molars.

Cases of blindness, tinnitus aurium, trifacial neuralgia, otitis and other affections of the eye have been traced to

impaction of third molars. Where impaction has caused neuralgia, the pain may be slight or very severe, and is often excruciating.

Inflammatory Reactions of the Hard Tissues.—These are as follows:

1. Dental caries of the crown of the lower second molar caused by impingement of the impacted third molar.

2. Dental caries occurring in the impacted third molar, thus causing an obscure pain.

3. Pathologic resorption of one or more roots of the second lower molar caused by impaction of the third molar.

4. Alveolar abscess, osteitis, osteomyelitis, necrosis and cyst or cystic tumor in the bone, resulting from long continued irritation to the bone cells.

5. Tissue deterioration so great or extensive that the inferior dental canal is frequently infringed upon or actually invaded.

CONCLUSION

The impaction of teeth is not dependent solely on environmental conditions, but may more reasonably be regarded as a form of "abnormal dentition which most likely has some ontogenetic significance or is caused by some developmental abnormality."

Impacted teeth must be looked upon as misplaced bodies which are potential sources of trouble. Frequently such teeth are regarded as harmless. However, clinical experience has shown that they are not uncommonly the source of various and serious complications. Reports from experienced observers confirm the conclusion that an impacted tooth which cannot be brought to function properly is best removed since, as an impacted tooth, it is outside the possibility of usefulness.

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15 Grove Street.

A NEW SYSTEM OF CAVITY PREPARATION FOR METALLIC INLAYS

CECIL PINCUS, B.D.Sc., L.D.S., Melbourne, Australia

IN the July issue of THE JOURNAL, there appeared an article on "Cast Dowel Retention," in which Harold J. Cutler mentioned the use of tapered fissure burs to obtain retention for inlays.

I described a similar procedure in an article entitled "Veneer Pinlays," which appeared in the August 1935 issue of the *Australian Journal of Dentistry*.

In my original article, I stated that "700 and 701 tapered fissure burs were most suitable for the formation of a retentive pit for an inlay," and that "the slight taper facilitates the introduction of the wax into the pit, and also permits small errors in the attempts to sink two exactly parallel pits in one cavity." I did not go into this matter as scientifically as did Dr. Cutler, but I feel pleased that his investigations have supported my contentions regarding this method of inlay retention, which, in my opinion, is superior to that afforded by the Black's system of cavity preparation.

A method of casting porcelain inlays was shown in London at a dental congress held there just before the beginning of this war. I therefore prefer to use the term metallic inlay.

Dr. Black originally designed his system for amalgam and gold fillings, but a metallic inlay, being stronger than a malleted gold or amalgam restoration, does not need a similar resistance and retention form. It is not necessary to remove healthy dentin from a cavity in order to retain a metallic inlay, which can be made adequately secure in any situation by means of what Dr. Cutler has very aptly termed "cast dowel retention." Such restorations may be described as "veneer pinlays."

Cavity preparation for a veneer pinlay is simple, involving two steps:

1. The cavity outline form is cut into the enamel with burs, carborundum or diamond stones, to form a saucer-shaped cavity. No healthy dentin need be removed.

2. Retention is obtained by sinking two small pits, not more than 1 mm. deep, into the dentin, with a No. 700 or 701 tapered fissure bur. No further excavation of dentin for retention is necessary. An inlay need never extend into the tooth below the dentino-enamel junction, except at the retentive pits.

This procedure is diagrammatically illustrated in Figure 1. The thick black line represents a vertical section of a cavity preparation for a veneer pinlay; E is the enamel; DE, the dentino-enamel junction; RR, the two retentive pits. The dotted line is a section of a Black cavity preparation for an inlay involving the same outline form as the veneer pinlay.

This procedure is suitable for Class I and Class V cavities, the Class V veneer pinlay being much less sensitive to thermal shocks than the usual box-form metallic inlays. But the operator must be careful to drill the retentive pits well at the mesial and distal extremities of Class V cavities, to avoid the pulp, as illustrated in Figure 2.

Although Dr. Cutler uses the indirect inlay technic, wax patterns are so easily obtained in the mouth in these simple Class I and Class V cavities that, in my

opinion, the indirect technic would be an unnecessary waste of time. But perhaps I am prejudiced, as my metallic inlay work has been all direct technic, as is the custom here in Australia.

Compound cavities are treated in the same way as simple cavities, but the retentive pits are sunk in the direction in which the sprue wire is to be inserted. Figure 3 illustrates a vertical section of

Figure 1.

Figure 2.

Figure 3.

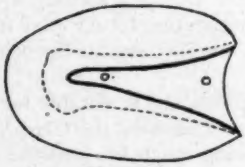
Figure 4.

a veneer pinlay cavity preparation for a Class II cavity in a bicuspid. Figure 4 is a horizontal view of the same preparation.

It is not uncommon for a dentist to find that the marginal ridge on the sound side of a bicuspid has been fractured by the insertion of the usual type of inlay in a Class II cavity on the other side of this tooth. The veneer pinlay cavity preparation prevents such fractures, because the sound marginal ridge is not weakened as in the cutting of a box-form cavity into the sound dentin on the occlusal surface, as indicated by the dotted lines in Figures 3 and 4.

Figure 5.

Figure 6.

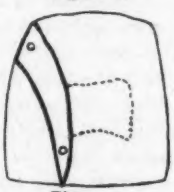
Figure 7.

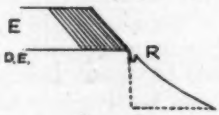

Figure 8.

Figure 9.

In Class III cavities, the smallest size tapered diamond point is used to smooth and flare the surface so that the pattern will draw labially. The two retentive pits are sunk just under the labial enamel edge with a No. 700 straight tapered fissure bur held nearly perpendicularly to the labial surface, but swung laterally

enough to enter the dentin just underneath the labial enamel, as in Figure 5. This pattern can be drawn labially without separation, but a little separation will facilitate the withdrawal.

If a Class III cavity outline has to be extended on to the labial surface, the retentive pits can be sunk at right angles to the long axis of the tooth, as in Figure 6. A Class III cavity that extends onto the lingual surface can be drawn lingually, the retentive pits being sunk with a right angle 700 bur in the lingual surface. The preparation is similar to that employed for a Class IV cavity; in which case, there is no necessity for the dovetail of the conventional preparation.

Figure 7 illustrates the lingual aspect of the preparation for a Class IV cavity, which is flared by the tapered diamond stone, so that the pattern will draw lingually. One retentive pit is sunk near the gingival margin, and the other near the incisal edge, so as to avoid the pulp. The dotted line shows the lingual outline of the usual cavity for a metallic inlay for a Class IV cavity.

In the preparation of any cavity for a metallic inlay, the sinking of a retentive pit at the dentino-enamel junction will obviate "squaring out" of the dentin. This is illustrated in Figure 8, the retentive pit R preventing sacrifice of the dentin enclosed in the triangular area between the dotted lines and the dentinal floor of the cavity.

The replacement of the whole crown of a vital tooth may be easily accomplished by means of three or four retentive pits sunk at the dentino-enamel junction, as illustrated in Figure 9.

In conclusion, I suggest that much conservation of healthy tooth tissues would result from the general adoption by dentists of this veneer pinlay technic.

THE JOURNAL *of the*
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L. PIERCE ANTHONY, D.D.S., Editor
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JULY 1 *Editorial Department* 1944

THE EDUCATIONAL PROGRAM FOR SUPPLYING DENTISTS TO THE ARMY

IN July 1943, the Procurement and Assignment Service of the Army practically commandeered the medical and dental educational facilities of the United States with the immediate objective of assuring to the Army an adequate supply of physicians and dentists to meet the war time requirements of the armed forces.

The response to the request for cooperation by the medical and dental schools was complete accord and sympathy with the project, and all dental schools immediately volunteered their facilities to further a program projected by the Army Selective Service.

Accordingly, the Army authorities outlined and, with the aid of the schools, inaugurated a program directed solely to supplying the medical and dental needs of the Army. Because of the apparent urgent necessity for such a program, the civilian need for dentists was almost entirely ignored, and regardless of the emergency faced by the profession in view of the increasing dental needs of an increasing population, the major portion of the output of the schools was earmarked for the Army. This

But now, just when we felt that the new program would not only provide for the needs of the Armed Forces as well as the increase in civilian need, comes the announcement that the men trained under the new program will not be commissioned into the Army Corps, but will be returned to civilian status and be subject to the exigency of being drafted into some other branch of the service.

With all due respect to the judgment of the Army authorities and with due praise for the seriousness with which they accepted their responsibilities, it would seem that the health service of the nation and the educational system of dentistry is in imminent danger of serious and tragic disruption.

The situation created is indeed so critical that, on May 31, the executive officers of the American Association of Dental Schools, the executive officers of the Council on Dental Education of the American Dental Association and the Ad Interim committee of the Board of Trustees of the American Dental Association met in Washington for the purpose of considering ways and means of maintaining a steady supply of dentists to meet the constantly growing needs of the civilian population.

Our representatives in Washington, the professional school authorities and special committees of the American Dental Association are working diligently to adjust this very difficult situation and avoid the possible calamitous effect upon professional health services. And we are encouraged to believe from the assurances of those directly charged with the conduct of the Association's affairs that a satisfactory and early solution of the problem is in the making.

The direful result, it appears, if the present proposed restrictions of the government are enforced, will be that there will immediately be eliminated from the entering classes of the dental schools some 2,000 students, with little hope of supplying the deficiency.

The conference of the American Dental Schools, the Council on Dental Education and the Ad Interim Committee of the American Dental Association proposed, as a means of averting the threatened calamity to the dental educational system, that the War and Navy Departments permit not to exceed 2,000 qualified young men now in the armed forces to enter dental schools or to complete their predental training in 1945, the selection of such students being left to the dental schools and the War and Navy Departments.

In this, as in all projects proposed by the Procurement and Assignment service in the effort to supply dentists for the Armed Forces, the

program seemed to operate comparatively smoothly, although it placed inordinate burdens and restrictions on the schools, until May of this year, when it was announced that the supply of dentists was exceeding the needs of the Army and that all dental students completing their Army Specialized Training Program course in June, 250 in number, will be given honorable discharge from the Army and will return to civilian status.

To say that this announcement created consternation in dental circles is to put it mildly. It was as though the Army authorities had said to the schools and the profession, "We commandeered your educational facilities to meet an emergency; we have disrupted your whole system; restricted the normal source of student supply, and crippled your teaching staffs, but now the emergency is met and we do not need any more dentists; take back your schools and resume your original program with the severe handicap of our interference."

While the Procurement and Assignment authorities say that these conditions apply only to those graduating in June 1944, we have no assurance as to the disposition of future classes.

The one ameliorating feature of the present condition is that these young graduates are recommended to seek other branches of the service than the Army Dental Corps; i.e., the Navy, the U. S. Public Health Service and the Veterans Administration. The indications at present are that this class of 250 can be provided for in the services mentioned, but that only leaves the outlook for future classes of induction into the ranks of a specialized group of men trained for service in the Dental Corps, and fails to provide for the men who have enlisted in the predental courses and are now in school.

Worst of all, it leaves the civilian population without a continuing source of dentists and with crippled facilities for re-establishing a source to meet the normal needs of the profession, and at a time when we are just recovering from a period of decline in the school enrollment.

During the decade prior to the war, the ratio of dentists to civil population showed a steady decline. The upward curve of enrollment in the dental schools, which began before the war, gave hopeful evidence that ample provision would be made for civilian needs. There is now indication on every hand that more extended dental service than the country has ever witnessed will be called for after the war. It is therefore of utmost importance that the current training of dentists be continued without interruption.

services of all agencies of the American Association of Dental Schools, the Council on Dental Education and the American Dental Association are placed at the disposal of the proper governmental authorities toward a satisfactory solution of a distressingly serious problem.

THE ATLANTA-SOUTHERN DENTAL COLLEGE MERGES WITH EMORY UNIVERSITY

IT IS indeed with much pleasure that we announce the merger of the Atlanta-Southern Dental School and Emory University and the incorporation of the dental school into the Emory University educational system.

For nearly two decades the objective of the educational leaders of the dental profession has been the incorporation of all the schools of American Association of Dental Schools into universities as integral parts of their university educational system. The merging of the Atlanta-Southern Dental College with Emory University signalizes an almost complete accomplishment of that aim. There now remain only a few dental schools without distinct bona fide university connection, and those have definite promise of university association within the near future.

Realizing fully the desirability of including dental education in the university system and bringing the dental student under the university discipline, the present Council on Dental Education soon after its appointment by the American Dental Association, the American Association of Dental Schools and the National Association of Dental Examiners expressed as one of its purposes the use of its every effort to bring about association of every dental school in the country with a university.

The affiliation of the Atlanta-Southern with Emory has been under advisement for some time; until the desirability of such an association became so apparent that the directing bodies of the two institutions delegated President White of Emory and Dean Byrnes of the Atlanta-Southern as a conference committee to determine the consummation of the association.

The merger here announced is due in part to the efforts of the Council and particularly those of the Executive Secretary, Dr. Horner.

Having been associated with the professional educational system of New York State for many years and realizing the desirability of includ-

ing dental education in the university system, Dr. Horner has so convincingly advocated the incorporation of dental education in the university discipline that he has been able to bring about such association on the part of several dental schools, the latest one being the Atlanta-Southern Dental College.

The consummation of this merger will enable Emory to approach nearer to its aim of a universal educational institution by incorporating dentistry in its system, and will give to the Atlanta-Southern Dental School the educational prestige that will enable it to serve more effectively a large section of the country where dentistry is appreciated as a public health service.

The merger of the Atlanta-Southern as an integral part of Emory is particularly pleasing to the writer for the reason that Emory is his academic alma mater, while the Atlanta-Southern is his professional alma mater. We have long hoped for such an eventuality as has now occurred and we are filled with pride and optimism for the future usefulness of Emory University and its Dental School.

BILIOGRAPHICAL

A Textbook of Exodontia, Oral Surgery and Anesthesia.

By LEO WINTER, D.D.S., M.D., F.A.C.D., Sc.D. (Hon.), LL.D., Professor of Oral Surgery, New York University; Director of the Oral and Minor Surgery Clinic, New York University College of Dentistry; Visiting Oral Surgeon in Charge, Bellevue Hospital; Consulting Oral Surgeon, Montefiore Hospital; Chief of Dental Clinic, New York University College of Medicine; Fellow, New York Academy of Medicine. Fifth Revised Edition. 576 pages, 485 illustrations, 7 color plates. Price, $10. St. Louis: C. V. Mosby Company, 1943.

To meet the demand for an up-to-date textbook of exodontia, a fifth edition of Dr. Winter's book has been published. This edition is essentially the same as the last one, to which has been added new material on chemotherapy, general anesthesia and extra-oral local anesthesia. Five full page color pictures illustrating the technic for extra-oral local anesthesia are a definite asset to this new edition. As in the earlier editions, Dr. Winter discusses the development of local anesthesia; details of the modern local anesthetic agents; technic for intra-oral and extra-oral injection technic; general anesthesia; extraction of teeth; removal of impacted teeth; control of infection, hemorrhage and pain, and classification, diagnosis and treatment of cysts. Illustrations of instruments, models and patients and roentgenograms supplement the descriptions in the text. A page and a half of references is included. The book, which is written in a concise, didactic manner, has always been popular with students who desire to increase their knowledge of the theory of exodontia and minor oral surgery.

Traumatic Injuries of Facial Bones: An Atlas of Treatment.

By JOHN B. ERICH, M.S., D.D.S., M.D., Consultant in Laryngology, Oral and Plastic Surgery at the Mayo Clinic, and Louie T. Austin, D.D.S., F.A.C.D., Head of the Section on Dental Surgery at the Mayo Clinic, in Collaboration with the Bureau of Medicine and Surgery, U. S. Navy. Cloth. 600 pages, 333 illustrations. Price $6. Philadelphia: W. B. Saunders Co., 1944.

THIS new book is an attempt by the authors to provide a suitable manual illustrating methods of reduction and fixation of all conceivable fractures of the facial bones. As the authors point out in the preface, fractures of the facial bones should not be segregated as to the bone involved and then distributed to various specialists. Otolaryngologists, plastic surgeons, general surgeons, orthopedic surgeons and dentists all manage certain fractures of these bones. Satisfactory results, however, depend on intimate correlation of the plastic surgeon and the dentist in the handling of most of these fractures. The book, therefore, represents a collaboration of a plastic surgeon and a dentist, describing the most suitable methods of treatment. In this objective, the book is eminently successful. The volume is profusely illustrated with clear photographs of moulages, describing the various fractures and their treatment. The text is short, but adequate, maintaining the idea of a "handbook." This new book can be heartily recommended to those interested in a concise, complete monograph covering this field.

F. F. K.

CORRECTION

In the article on "Bite Opening: A Cephalometric Analysis," by Bahador and Higley on page 343 of the March 1 issue of THE JOURNAL for 1944, the first sentence of the last paragraph on this page ended with the words "mandibular posterior teeth," which should have been "mandibular incisors"; then, the next sentence was omitted in the manuscript.

The first two sentences of the last paragraph on page 343 should, therefore, read as follows:

Hemley,[4] in contrast to these investigators, is of the opinion that the bite can be opened with little or no intrusion of the mandibular incisors. His data show that this increase in vertical dimension of the face is brought about by the vertical increase of the mandibular posterior teeth.

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WAR SERVICE COMMITTEE

DEFERMENT OF DENTAL TECHNICIANS

To the Chairmen of State Military Affairs Committees
Secretaries of State Societies
Editors of Dental Journals

With further reference to the deferment of dental technicians, as discussed in Bull. No. 66, dated April 7, 1944, for the information of those concerned with this problem, I quote the following reply, dated April 28, 1944, from Mr. Collis Stocking, chairman, in response to the request placed with the Essential Activities Committee:

> This is in further response to your letters of March 23 and April 24 relative to your request that senior dental technicians over 30 years of age should be added to the List of Critical Occupations.
>
> The War Manpower Commission's Interdepartmental Committee on Essential Activities composed of representatives of the War Department, Navy Department, Selective Service, War Production Board, War Manpower Commission and Department of Agriculture has given very careful consideration to this request and has decided to continue to exclude the occupation from the list.
>
> The Committee felt that since the dental technician was listed under Group 32, Health and Welfare Services of the List of Essential Activities, and your request was limited to technicians over 30 years of age, the present procedure of Selective Service, of considering for deferment those over 26 years of age engaged in an essential activity would give this occupation ample protection.

Apparently, the various recommendations and protests to the War Manpower Commission and Selective Service, and the present status of the armed forces, brought about a reconsideration of the manpower problem, with the result that General Hershey has today issued a memorandum changing the policy to be followed by local boards in the classification of registrants by age groups, by the following wording:

> PART VI—SPECIAL POLICIES AND PROCEDURES
>
> 1. Determination of the status of a registrant with respect to an activity in war production or in support of the *national health,* safety or interest.—It is the function of the local board, except as otherwise provided in Part II of this memorandum, to determine the status of a registrant with respect to an activity in war production or in support of the *national health,* safety or interest. The information contained in the List of Essential Activities prepared by the War Manpower Commission . . . is used by the United States Employment Service in connection with the recruitment, transfer and placement of workers. The activities contained in this list represent on a national basis the most important activities in war production and in support of the *national health,* safety or interest. The List of Essential Activities should be used by the agencies of the Selective Service System as a guide and should be considered in occupational classification matters along with all other available information. Under present circumstances, local boards are warranted in determining that registrants engaged in many activities not contained on this list are engaged in activities in support of the *national health,* safety or interest and it is the responsibility of the local board to make this determination. For the guidance of the local board,

> consideration for occupational deferments may be given on a local basis to registrants engaged in activities which are related to utilities, food, clothing, fuel, housing, *health,* safety and other services or endeavors required for the preservation and effectiveness of the life of a nation at war.

In the release, it is also brought out that the rigid requirements for occupational deferment for registrants in the 18 through 25 year old group remain the same; but

> Registrants in the 26 through 29 year old group who are found to be "necessary to and regularly engaged in" an activity in war production or in support of the *national health,* safety or interest, have the prospect, according to the memorandum sent to local boards, of remaining in civilian life for the time being, subject to adjustment as the needs of the armed forces change.
>
> The prospect for registrants ages 30 through 37 . . . regardless of their physical condition, and for registrants of any age who are either disqualified for general military service or qualified for limited military service only, and who are regularly engaged in and who remain in activities in war production or in support of the *national health,* safety or interest is that they will remain in civilian life for an indefinite period, subject to adjustment as the needs of the armed forces change.

In individual meritorious cases, it is urged that State Military Affairs Committees, dental laboratories and interested dentists make the proper intercessions with local boards in behalf of these men, stressing the position that dental technicians, under the supervision of the dental profession, hold in support of the *national health,* safety and interest; seeing that appeals are taken when necessary to the State Selective Service Director and to Washington, if unsuccessful at the state level.

It is hoped, in view of the foregoing attitude expressed by the War Manpower Commission, and that of Selective Service, that the dental laboratory situation will become more stabilized.

C. WILLARD CAMALIER,
Chairman.

DENTAL HISTORY OF THE WAR

The War Service Committee is pleased to quote below excerpts from a letter received by the President from the National Research Council. Briefly, because of the increasing importance of dental service in the war effort, the Council feels that a special volume devoted to the history of dentistry during the war is appropriate and necessary, and has asked the President of the American Dental Association to undertake the responsibility of planning such a volume. Dr. Wells has since been officially appointed as editor, with William N. Hodgkin, Warrenton, Va., chairman of the Council on Dental Education, and W. Harry Archer, chairman of the History Committee, assistant editors.

The National Research Council in July of 1940 was asked by the Surgeons General of the Army and Navy to cooperate in planning an over-all medical history of the emergency, and this has subsequently developed into planning the medical history of the war. The subject of dentistry had originally been planned in two sections, one assigned to medicine and the other to surgery.

At the last meeting of our subcommittee, it was recommended, in view of the increasing importance of the dental services in the war effort, to have a separate volume devoted to dentistry, and I was instructed to lay the matter before you in the hope that you would be willing as President of the American Dental Association to undertake the responsibility of planning such a volume. Most of our editors of individual volumes are out of uniform, and the request comes to you from the National Research Council to the American Dental Association rather than as an official request from Admiral McIntire.

If you should choose as authors men who are in uniform, official designation would be required from the Offices of the Surgeons General if they are to be appointed. Civilian authors would be nominated by you and ultimately passed on by the subcommittee and Lewis H. Weed as chairman of the Division of Medical Sciences.

J. F. FULTON, M.D.

BUREAU OF PUBLIC RELATIONS

REPORTING OF VINCENT'S INFECTION

BION R. EAST, D.D.S., New York, N. Y.

IS Vincent's infection a communicable disease? Does the evidence on which its contagiousness is based warrant adoption by health departments of regulations requiring reporting it? It is apparent that the various state health departments are not in agreement on this matter. In 1939, twenty-two states did and twenty-six did not require that the disease be reported to the state health departments.

What has been the experience of the various state health departments with the regulation? Has its adoption led to the discovery of an unusual number of cases of Vincent's infection? Have epidemics been disclosed? Have the collected data been of assistance in preventing or curing the disease? Does the number of reported cases indicate, actually, the incidence of the disease? Does it indicate that dentists and physicians do or do not faithfully report cases?

During 1942, each state health department known to require reporting of Vincent's infection in 1939 was asked to furnish data on cases reported annually since the regulation was adopted. Data were furnished by twelve of the twenty-two states. From these data, crude morbidity rates per hundred thousand population were calculated. The rates are given by years for the twelve states in Table 2.

These morbidity rates for Vincent's infection suggest that:

1. The incidence of Vincent's infection, on the basis of the number of reported cases, among the populations of the twelve states, was relatively low.

2. Apparently, the disease was not readily transmitted from man to man.

3. The over-all care (isolation and treatment) of the cases of the disease was effective.

From the DeLamar Institute of Public Health, College of Physicians and Surgeons, Columbia University.

TABLE 1.—STATES WHERE REPORTING OF VINCENT'S INFECTION WAS OR WAS NOT REQUIRED BY STATE HEALTH DEPARTMENT REGULATION IN 1939*

Reporting Required	Reporting Not Required
Arizona	Alabama
Arkansas	California
Idaho	Colorado
Illinois	Connecticut
Iowa	Delaware
Kansas	District of Columbia
Kentucky	Florida
Maine	Georgia
Michigan	Louisiana
Minnesota	Maryland
Nevada	Massachusetts
New York†	Mississippi
North Carolina	Missouri
North Dakota	Montana
Ohio	Nebraska
Oklahoma	New Hampshire
Oregon	New Jersey
Rhode Island	New Mexico
Tennessee	Pennsylvania
Vermont	South Carolina
Washington	South Dakota
West Virginia	Texas
	Utah
Total 22	Virginia
	Wisconsin
	Wyoming
	Total 26

*Cady, F. C.: Dental Health Organizations in State Departments of Health of the United States. Public Health Bulletin, No. 251, 1939.

†Discontinued April 1942. (Private communication to the author.)

4. Dentists and physicians did not recognize the disease.

5. Dentists and physicians failed to report the cases that they observed, either because they were not aware of the regulation or because they doubted its necessity.

6. Individuals with the disease did not consult dentists or physicians.

More convincing evidence concerning any or all of these and other possibilities seems desirable. If the disease is, in fact, communicable, and is a public health menace, the regulation should be enforced. On the other hand, if Vincent's infection is not transmissible from man to man, it seems desirable that the regulation be discontinued, as was done in New York State after an experience with the regulation over a nineteen-year period.

600 West One Hundred Sixty-Eighth Street.

TABLE 2.—CRUDE MORBIDITY RATE PER HUNDRED THOUSAND POPULATION FOR VINCENT'S INFECTION BASED ON NUMBER OF CASES REPORTED TO TWELVE STATE HEALTH DEPARTMENTS FOR SPECIFIED YEARS

State	Illinois	Iowa	Kansas	Kentucky	Maine	Michigan	New York (Exclusive of New York City)	North Carolina	Tennessee	Vermont	Washington	Rhode Island
Reporting Experience in Years	11	12	18	3	23	8	19	4	16	4	19	5
Year	Rate per Hundred Thousand Population											
1919					0.13							
1920					0.00							
1921					0.00							
1922					0.00							
1923					1.80		2.69				0.07	
1924			0.50		7.03		5.00				0.07	
1925			0.33		7.51		6.93				0.00	
1926			0.11		11.67		10.18		0.08		0.13	
1927			2.11		14.16		17.49		0.08		0.66	
1928			1.13		14.99		15.59		1.74		0.46	
1929			1.76		9.69		15.00		2.84		2.33	
1930		1.45	2.65		7.38		18.11		2.40		28.99	
1931	1.24	1.45	5.74		10.55		15.43		1.62		0.44	
1932	11.04	0.76	10.62		7.89		18.52		3.61		0.81	
1933	8.07	0.56	3.04		6.99		16.11		3.13		0.56	
1934	9.77	0.60	3.59		4.39	5.96	29.80		3.06		0.31	
1935	2.75	0.20	0.00		5.46	4.82	14.75		2.34		20.95	
1936	3.87	0.36	9.26		10.14	6.14	13.88		6.21		0.30	
1937	3.85	0.64	4.85		13.94	4.24	14.08		3.92		0.42	0.00
1938	2.00	0.56	8.47		11.46	3.24	16.01	0.83	2.34	6.74	1.41	0.00
1939	3.13	0.71	7.24	4.02	4.51	3.69	12.48	0.40	7.99	5.59	0.70	0.00
1940	3.77	0.71	9.11	4.50	5.19	3.87	8.45	3.74	6.88	18.37	0.86	0.00
1941	2.60	0.75	7.39	15.42	4.45	3.58	9.29	2.35	2.95	29.10	1.99	0.00

DENTISTRY TELLS ITS STORY

JOSEPHINE BESSEMS*

MARK TWAIN'S famous remark about the weather might well apply to promotional efforts for dentistry—"Everybody's always talking about it, but nobody ever does anything!"

It has been reliably estimated that only about 20 to 25 per cent of our people have regular dental care. Lack of the means to pay for services accounts for many cases, of course, but it is not the principal reason that the public stays away from the dentist's chair. The real reason that millions of men and women who need dental care do not avail themselves of the benefits of modern dental science is the fact that they have not been educated to desire dental care as acutely as they desire automobiles and radios, permanent waves and fur coats.

For several years, the Chicago Dental Society had felt the need of a comprehensive program of public education in dental health in the greater Chicago area. After much discussion and investigation, it was decided to set up a separate educational organization. Consequently, the Dental Hygiene Institute of Chicago was born, February 1, 1942, with the stated objective "to promote the public health and welfare by the dissemination of knowledge and information pertaining to dental hygiene."

The institute is a complete, autonomous entity, with its own officers and board of directors, including both dentists and laymen, its own office and its own employes (numbering four at the present time). The Chicago Dental Society, however, maintains control over policies by a provision of the bylaws which stipulates that no activities or programs may be undertaken without the approval of the institute's Professional Policy and Guidance Committee, which is made up of dentists nominated by the society.

Financial support of the institute is derived from three sources: (1) a direct grant from the treasury of the Chicago Dental Society, about 50 per cent of the current year's budget coming from this source; (2) contributions from dental dealers, manufacturers and laboratories, and (3) individual memberships from both dentists and laymen.

To date, the institute has undertaken four major educational activities:

1. Production and showing of educational films.—Since one of the most potent means of presenting a convincing story is the visual, it was decided at the outset that the production and showing of educational films should be an important part of the institute's program. Two sound-slide films, for adult audiences, have been produced by the institute: "The Keys to Health and Happiness" and "The Mortons Make Some Changes," both of which have been reviewed in THE JOURNAL.

These films, which are non-technical and entertaining, are shown without charge by the institute before lay audiences in Cook, Lake and DuPage counties (the territory of the Chicago Dental Society). These audiences include clubs, parent-teacher associations, lodges, church groups, men's service clubs, employe groups and high school health classes. The institute's field representative, a woman experienced in educational and group contact work, takes the projection equipment with her, shows the film and usually conducts a round-table discussion afterwards. Because the questions asked are such that only a dentist

*Educational director, Dental Hygiene Institute of Chicago.

should attempt to answer them, arrangements are made for a dentist to be present. Because they are not asked to make speeches, only to answer questions, members of the Chicago Dental Society, busy as they are at the present time, have been very cooperative in accepting these assignments. Total attendance at these film showings in 1943 was 17,167. It probably will exceed 40,000 in 1944.

The institute plans to produce another film, designed especially for industrial audiences, in the near future.

Several copies of a dental film for young children, produced by another organization, have been purchased by the institute and presented to the film library of the Chicago public schools, and other children's films will be acquired from time to time for school use.

2. Publicity in all available media. Articles on dental health prepared by the institute staff are published in newspapers and magazines. A weekly column entitled "Your Teeth" is used chiefly by community and suburban newspapers. Radio is also used, whenever free time is available on the local stations. Before release, all copy is checked by a committee of dentists for accuracy as to scientific facts and professional policy.

3. Dental Health Week. To focus public attention on the importance of dental health in wartime, the Institute sponsored a dental health week in April 1943, which was repeated in 1944. Through this device, dental health was made "spot news" and publicity not available under ordinary circumstances was obtained in the daily papers and on the air. In addition to newspaper and radio publicity, there were posters, exhibits, window displays in stores and forum meetings to which representatives of women's clubs and parent-teacher organizations were invited. Use of a giant motograph sign on the Outer Drive, which flashed a dental health message each evening during the week, was donated by its owner.

The "week" is an old, but still very effective publicity device. It does not, of course, take the place of a year-round educational program, but supplements the program regularly carried on. By concentrating much publicity in a short period of time, dental health is spotlighted in the public mind.

4. Industrial program.—Most recent activity to get under way is an industrial educational program. This includes a revival of the industrial diagnostic service pioneered several years ago by the Chicago Dental Society.

This diagnostic project consists of full-mouth x-ray and clinical examinations of industrial workers at their places of employment, on company time and without cost to the employe. Roentgenograms and clinical records are sent to the dentist of the employe's own choice, who is authorized to call the patient to make an appointment to begin treatment. Actual costs of the examination, averaging around $2 per employe, are borne by the company whose employes are examined, the institute furnishing supervision and certain items of equipment. A checkup is made in six months to determine how many of the workers have reported for treatment and how much of the indicated work has been completed.

There is, on the part of industrial management, a slowly awakening awareness of the importance of dental health and the relation between dental infection and absenteeism. Coupled with this is a growing interest in dental health education and a demand for educational material. Much experimental work must be done to develop an effective dental health education program for industry, but those who guide the institute's policies believe that here lies one of its biggest opportunities.

This, in brief, is the educational program of the Dental Hygiene Institute of Chicago. So far, it has been largely experimental. Some of the original plans

have had to be revised, as experience has brought to light a better way. Other activities undoubtedly will be added from time to time.

The good that accrues from such a program cannot be measured. It is a long-term endeavor, the fruits of which will be reaped in the postwar years.

PERFECT TEETH

A. G. BARKER, D.D.S., Jefferson, Iowa

A perfect set of teeth must be absolutely free from dental caries. They must be sized, shaped and set true and properly in the dental arch. They must have proper shade, colorings and translucence to blend perfectly with the surrounding gum tissue, the eyes, hair and complexion. They must have perfect cusps, grooves, pits, fissures and marginal ridges. In other words, they must match exactly the engraved cuts of properly formed teeth as shown in G. V. Black's "Dental Anatomy." They must occlude perfectly. The roots must be set in sound, dense well-formed process covered by healthy pink gum tissue.

DURING the years of my dental practice, I have examined the teeth of approximately 25,000 people. Out of that vast multitude, I have found but one person whose teeth have fulfilled all of the above-listed specifications. In addition, in this case, the *L. acidophilus* count is negative. Miss Lois Price, 18 years old, who was born and who has lived all of her life in Jefferson, Iowa, came to me not as a patient, but as a dental assistant, and has worked by my side every day for six months. Thus I have had an excellent opportunity to study the case. The first day that she entered my office, her teeth fascinated me. After a few days, I asked her to permit me to examine her teeth more closely. It was then that I found her teeth possessed all of the above-listed qualifications. I asked her questions about her family, her life and her diet. Here is the rare and almost unbelievable part of the story: she has never in her lifetime consumed pastry of any kind, candy, ice cream, fruit (except oranges), soft drinks, coffee, tea or commercial vitamins. She has merely tasted them and just cannot eat them. The case was so rare and unbelievable that I took the matter up with her boy and girl friends, asking them what Lois ordered when they went into the ice cream parlor for cokes, banana splits, chocolate sundaes and so on. They told me that sometimes she drank a glass of milk or a glass of water or ate a dark bread sandwich.

Her diet for three days is shown in the tabulation:

BREAKFAST	DINNER	SUPPER
Milk	Potatoes	Spaghetti
½ orange	Gravy	Milk
Oatmeal	Navy beans	Bread
(no sugar)	Lettuce	
Toast	Steak	
	Water	
Milk	Potatoes	Meat sandwiches
½ orange	Gravy	Radishes
Oatmeal	Ham	Crackers and
(no sugar)	Peas	peanut butter
Toast	Bread and butter	Milk
	Radishes	
	Rice	
	Milk	
Milk	Potatoes	Eggs
Oatmeal	Gravy	Meat
(no sugar)	Breaded pork	Milk
Toast	cutlets	Bread and butter
	Peas	Celery
	Bread and butter	
	Milk	
	Dill Pickles	

I took Miss Price into the clinic at the Iowa State Dental Meeting May 2.

The interest shown by the dentists of Iowa was far beyond my expectations. They were of the opinion that she was in a class by herself for perfect teeth.

I do not believe it to be by chance that Lois Price has such wonderful teeth, or that the low sugar content of her diet had nothing to do with it.

For the real advancement of dentistry to all of the people of this country, I believe we dentists have "missed the boat." When a patient comes to us with a nearly perfect set of teeth, no cavities, no stain, no calculus, we say to him, "A fine set of teeth," and "I bid you good day!"

Why not make out a record card for the patients that come to you that have good teeth and healthy mouths, in an attempt to find out the reason for their good teeth? Enter on their record card their age and nationality, where they were born, where they have lived all of their lives, their regular diet and the condition of their families' teeth. Also insist that they see a dentist at least once a year.

Generally speaking, the condition of the children's teeth in this county is pathetic and alarming. Every conceivable effort should be put forth to do something about it.

REPORT OF DENTAL FINDINGS IN AN INDUSTRIAL HYGIENE SURVEY OF THE NATIONAL BATTERY COMPANY, LEAVENWORTH, KANSAS

LEON R. KRAMER,* D.D.S., M.S.P.H., Topeka, Kan.

ONE hundred sixteen persons, the total number of employes of the National Battery Co., Leavenworth, Kan., were given a dental examination, March 24, 1944. The object of the examination was to determine the general mouth health of the employes and to record conditions that might be contributed by their occupational contacts with lead in the industry.

The inspection was made in an exceptionally well-lighted room. A headlamp and wooden tongue depressors were used. Cases of special interest were examined with mouth mirror and explorer.

The 116 employes were distributed in departments as follows: office, 14; janitor, 4; shipping, 22; assembly, 25; casting, 16; paste, 9; separators, packing, trimming, charging, painting, farm light, repair, maintenance, rejection, etc., 30. Forty-eight of the employes were women, sixty-eight men. The length of employment ranged from one or two weeks to eighteen years.

Findings were recorded as follows: missing teeth, filled teeth, cavities unfilled, teeth needing extraction, prostheses, halo saturnis (purple gums) and gingival infection.

As indicated on the chart recording findings, the mouth conditions of the office force were excellent and every one showed good dental care. No halo saturnis (lead line) was found in this group.

All the janitors, who had been employed more than six months, showed halo saturnis, with little evidence of dental care. There was little or no evi-

*Director, Division of Dental Hygiene, Kansas State Board of Health.

dence of halo saturnis in those employed less than three years in the other departments of the factory. It was noted that practically all persons who had been employed for periods of more than three years presented evidence of purple coloring of carbon or hard tartar deposits on the teeth. Employes, several of whom had worked in the industry for many years, who daily brushed their teeth and had them cleaned at regular intervals presented little or no evidence of lead lines. Two persons, one female, the other male, presented typical halo saturnis from third molar to third molar in both upper and lower jaws. Both had subacute forms of advanced gingivitis. Neither one presented any evidence of oral care. Other cases were usually limited areas presenting tartar or showing advanced pyorrhea.

The over-all picture of the mouth conditions of the employes indicated that a high percentage of these persons had procured a considerable amount of dental service, more in fact than would normally be expected.

RECOMMENDATIONS

On the basis of the findings of this survey, the director of the Dental Division of the State Board of Health recommends the following procedures as a safeguard of the mouth health of employes of this and similar types of industry.

1. Reduce or control gingival and other infection by treatment, scaling or cleaning and extractions by the dentist.

2. Have the teeth cleaned by a dentist as often as necessary to prevent sustained gum irritation by calculus.

3. Brush the teeth properly, morning and evening. One part of table salt (finely granulated) and three parts of baking soda (mixed thoroughly) makes an effective tooth powder.

4. Have the condition of the teeth checked regularly by the dentist and have needed corrections made promptly.

A.D.A. 1945 APPOINTMENT BOOK NOW READY

THE Bureau of Public Relations is pleased to announce that the A.D.A. 1945 Appointment Book is now ready for distribution. Members who have become accustomed to using this book and others who may wish to use it are urged to order one at their very earliest convenience. Last year, many who waited until December before ordering were disappointed because the supply was exhausted. Please don't let that happen this year. It it does, don't say that we didn't warn you.

The 1945 book is dedicated to John Greenwood (1760 to 1815). Following the same design that has proved so popular in the past, the book is 7 by 10 in size and is bound in durable black imitation leather and lettered in gold. The layout permits a full week's appointments to be seen at a glance. In addition to the appointment pages, it contains helpful information regarding A.D.A. services available to all members. These include a list of the dental materials certified by the Research Commission, a list of the dentifrices accepted by the Council on Dental Therapeutics, a list of books and package libraries from the Library Bureau and a list of dental educational material from the Bureau of Public Relations.

It also contains a copy of the Code of Ethics of the American Dental Association, the organization chart and a district map of the A.D.A.

Because of war conditions, the price of the 1945 book has been raised to $1.50. Also because of the scarcity of labor and materials, the gold imprinting of dentists' names on the cover has had to be discontinued for the duration.

COUNCIL ON DENTAL THERAPEUTICS

NOTICE OF JUDGMENT UNDER THE FEDERAL FOOD, DRUG AND COSMETIC ACT

838. Misbranding of Ironized Yeast. U. S. v. 500 Cartons of Ironized Yeast. Consent decree of condemnation. Product ordered released under bond to be brought into compliance with the law. (F.D.C. No. 6512. Sample No. 74949-E.)

DECEMBER 20, 1941, the United States attorney for the Southern District of New York filed a libel against 500 Cartons of Ironized Yeast, at New York, N. Y., alleging that the article had been shipped in interstate commerce by the Ironized Yeast Co., Inc., from Atlanta, Ga.; and charging that it was misbranded. The article was labeled in part: "Each tablet contains reduced iron—Iron Peptonized Haemoglobin Vitamin B Concentrate from Yeast Lager Yeast."

The article was alleged to be misbranded in that certain statements in the labeling which represented that it would be efficacious for underweight, thin, run-down, tired and nervous people were false and misleading since they held out the promise and created the impression that consumption of the article as directed would result in gain of weight and increased vigor and appetite, and the disappearance of tiredness and nervousness, whereas the article when used as directed would not increase weight, overcome nervousness, produce vigor, improve the appetite, produce charm and popularity or otherwise accomplish the results promised, implied and represented.

October 26, 1942, the Ironized Yeast Co., Inc., claimant, having withdrawn its amended answer therefore entered and having consented to the entry of a decree, judgment of condemnation was entered and it was ordered that the product be released under bond conditioned that it be brought into compliance with the law under the supervision of the Food and Drug Administration.

FEDERAL TRADE COMMISSION STIPULATION ON BEAUTY COURSE AND COSMETICS

RICHARD HUDNUT, a New York corporation located at 113 West 18th St., New York, N. Y., entered into a stipulation with the Federal Trade Commission to cease and desist from the following representations in connection with the sale of a correspondence course in beauty culture designed "DuBarry Success Course" and cosmetics and toiletries sold for use with the course:

* * * * *

(2) That vitamins A and D can be depended on to increase general resistance to infection of the nose or throat; that vitamin A can be depended on to maintain the health and luster of tooth enamel or keeps the skin from becoming dry and scaly; that vitamin B can be depended on to improve the muscular tone or nourish nerve or brain tissue; that vitamin C can be depended on to maintain the health of teeth or prevent pyorrhea, bleeding of the gums or fatigue or general weakness; that vitamin D prevents tooth decay or aids the nervous system, or that vitamin G can be depended on to prevent dermatitis or assist in preventing lesions of the skin.

* * * * *

Stipulation 3840, June 2, 1944.

ACCEPTED DENTAL REMEDIES

The Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following articles in the list of Accepted Dental Remedies:

BARBITURATES*

Pentobarbital Sodium, U.S.P.—Pentobarbitalum Sodicum (Pentobarb. Sod.) Soluble Pentobarbital, U.S.P. XI. $C_{11}H_{17}N_2ONa$.

PROPERTIES: Pentobarbital sodium occurs as white crystalline granules or as a white powder. It is odorless and has a slightly bitter taste. It is very soluble in water and is freely soluble in alcohol, but practically insoluble in ether. Aqueous solutions of pentobarbital sodium are not stable.

ACTIONS AND USES: The actions and uses of pentobarbital sodium are essentially similar to those of barbital, but it is effective in smaller doses. The action is of relatively brief duration, which may constitute an advantage, especially when relatively large doses are administered. It is used as a sedative, particularly prior to local, general or spinal anesthesia. It can be used safely for such purposes only by those who have had adequate experience and who are familiar with the literature concerning such use. It may be administered by mouth.

DOSAGE: Orally, as hypnotic, 0.1 Gm. (1½ grains); as preanesthetic sedative, 0.2 Gm. (3 grains.)

Pulvules Pentobarbital Sodium 0.1 Gm. (1½ grains)—Lilly. Manufactured by Eli Lilly and Company, Indianapolis, Ind.

*A.D.R. Ed. 10, p. 68.

DENTIFRICES†

Shelby Tooth Paste: Composition: See Trade Brand Dental Cream.

Manufactured by the Trade Laboratories, Inc., Newark, N. J. Distributed by Shelby, Ltd., New York, N. Y.

CALCIUM COMPOUNDS‡

Snow Top Precipitated Calcium Carbonate Heavy and Medium: Snow Top precipitated calcium carbonates are stated to comply with the U.S.P. They are used in the manufacture of dentifrices.

Manufactured by the Industrial Chemical Sales Division, West Virginia Pulp and Paper Company, New York, N. Y., and Covington, Va. Patents No. 1,178,962, 1,266,339, and 2,081,112. U. S. trademark 282,919.

PARTICLE SIZE:

	Diameter in Microns				
	Less than 1	1 to 3	3 to 6	6 to 10	10 to 12
Heavy	.....	50	40	10	Occasional
Medium	Occasional	65	35	Occasional	Rare

DENSITY AND ABRASIVENESS:

	Flow Cc.	24 Hours Sedimentation Cc.	Drop Density Gm./Cc.	Abrasiveness
Heavy	15 to 19	19 to 26	0.800 to 0.675	8.3 mg.
Medium	19 to 27	26 to 40	0.675 to 0.550	6.3 mg.

SILVER PREPARATIONS§

Ammoniacal Solution of Silver Nitrate, N.F.—Liquor Argenti Nitratis Ammoniacalis (Liq. Arg. Nitrat. Ammon.) Ammoniacal Silver Nitrate Howe.

†A.D.R. Ed. 10, p. 96.
‡A.D.R. Ed. 10, p. 82.
§A.D.R. Ed. 10, p. 182.

Ammoniacal Silver Nitrate—O'Brien: A brand of Ammoniacal Solution of Silver Nitrate, N.F.

Manufactured by the O'Brien Drug Company, Omaha, Nebr.

Ampoules Ammoniacal Silver Nitrate—O'Brien.

Admission of a product to the list of Accepted Dental Rem-

edies does not imply a recommendation. It means that the product and the methods by which it was marketed at the time of consideration were not found to be in violation of the Council's published rules. Accepted products are reconsidered periodically. The files of the Council contain information on many drugs and dental cosmetics. All information is available, upon request, and inquiries are welcomed. A postal card will bring a prompt reply.

DONALD A. WALLACE, *Secretary*

COMMITTEE ON ECONOMICS

POSTWAR PLANNING: A REPORT AND SUGGESTED PROGRAM FOR THE DENTAL PROFESSION

As the European War appears to come nearer daily to a successful culmination, governments, industry, civic groups and even the man on the street are giving serious thought to the major problems of the future. Vital decisions must be made; blueprints of action conceived to cover the reorganization of the entire world to a peaceful way of life in its political, economic and social aspects upon international, national, state, local and personal levels.

In our society, complex in its economic and social structure, thinking men realize that planning must be done in order to make the readjustment from war to peace as effective and as quick as possible. Industries cannot overnight be made ready to switch from the manufacture of tanks to tank cars, bombers to automobiles, engines to refrigerators, or from hundreds of other military items to the ordinary everyday necessities of our life. Products for peace must be designed, factories retooled, workers retrained, sales and distribution organizations reactivated. Similarly, communities must plan to assimilate their fighting men as they return, to assist in their adjustment to the peaceful, workaday world, to replace slums and emergency housing with permanent, comfortable quarters, to expand health and recreational facilities which were curtailed during the war.

PROBLEMS OF THE DENTIST

Industry, trade, civic bodies and numerous other groups therefore are intensively at work readying the plans and machinery for "V-Day." It is no less urgent for the dental profession to do the same. While Johnny Doughboy—ten millions of him—will be coming home, planning to take up his life in the main as he left it at his farm or shop, the dentist will of necessity have to engage in more fundamental planning. In a large majority of cases, the dentist will face problems many times more complex than those faced by most other members of the armed forces, or even by many functioning units of the civilian economy. While most soldiers know that their former employers are holding their positions open for them, the soldier-dentist has no such comfortable assurance. Each of the 20,000 dentists in the armed forces—one for every three at home—might be thought of as making up a little industry, requiring demobilization, readjustment and possibly retraining or additional training, relocation, financing and reestablishment as an economic and health unit in a community. This process of readjustment

will in many cases cover a period of months, if not years.

It is estimated that almost one-third of the dentists in the armed forces had not practiced before the war, or had not fully established themselves in private practice before the war. For them, the question of where to locate will be paramount. Possibly quite a large fraction of the remainder are questioning the advisability of returning to their former locations. They, and some of the dentists now in civilian practice, are considering relocation of some type, within the locality, within the state or even elsewhere in the country. All of them are familiar with the striking differences in the distribution of dentists in the United States before the war. They have probably heard of the tremendous changes brought about by the war in the distribution of population, regionally as well as locally.

NET GAIN OR LOSS IN POPULATION IN SELECTED METROPOLITAN AREAS APRIL, 1940 TO NOVEMBER 1943*

Center	Numerical	Per Cent
Charleston, S. C.	44,125	37.5
Detroit, Mich.	238,292	10.0
Los Angeles, Calif.	378,292	13.0
Mobile, Ala.	86,248	60.9
New York, N. Y.	—820,644	— 7.1
Norfolk, Va.	183,559	57.1
Pittsburgh, Pa.	—166,666	— 7.8
San Francisco, Calif.	375,606	26.0
Scranton-Wilkes Barre, Pa.	—158,479	—21.3
Washington, D. C.	255,752	27.8

*Bureau of Census, Series P44, No. 3: Estimated Civilian Population of United States, by Counties: November 1, 1943; Washington, D. C.

A few concrete examples will illustrate the tremendous upheavals that have occurred during this period. While the total civilian population of the United States decreased 3.1 per cent from April 1940 to November 1943, the population of the Pacific coast states increased 13.3 per cent, or in actual figures 1,284,000. The population of the west north central states decreased 9.2 per cent, or 1,239,000. Even more striking changes occurred in individual states and metropolitan areas. These are illustrated in the accompanying tabulation.

The economic base of numerous areas has also changed. Rural agricultural areas have become manufacturing centers with thousands of workers; grain-producing areas have become livestock-producing areas; subsistence agriculture is being replaced partially by a more efficient "industrial" agriculture. In some areas, industries have closed up; in many areas, huge new industrial centers have developed almost overnight. The center of income of the United States has shifted, as well as the center of population.

Sociologists and economists have observed that, for a number of years, the population distribution of this country has revealed a movement out of the northeastern, west central and southern states to other parts of the country. Another trend is the movement of the population from rural areas to urban. This, in general, has continued during the war period, but at an accelerated pace. Many older dentists may have observed this in their own localities, and may have decided before 1940 that the process was so slow that they could serve out their lifetimes before their practices were seriously affected. Yet the movement of this country's population between certain areas from 1940 to 1944 has equaled if not surpassed what would have taken a "normal" lifetime.

In view of these changes, the dentist may wonder whether it is worth while to return to his former location, or whether the location he was considering is still suitable. He will also be concerned with the possibility of further important shifts as the nation switches back to a civilian economy, or as to whether other areas offer greater opportunities for service and for earning a livelihood. Knowing also that he

will be in competition to establish a practice against 20,000 others during a period of mild recession in the immediate postwar period, he might also be wondering about opportunities in other types of dental service—industrial, hospital, school or other public health work. It will be no wonder if he is confused and hesitant about making a decision.

DENTAL SOCIETY PLANNING

This general situation is engaging the attention of the Committee on Economics and other bodies in the national office of the American Dental Association, as well as of the officers of constituent societies. Reports have been received of programs being developed in various parts of the country. One of the most progressive is that of the Odontological Society of Western Pennsylvania. According to a report from W. Earle Craig, secretary, the society has compiled a summary of information on dentists in service and those remaining in each county and locality in its district. In addition, the society has compiled data on population and employment and other pertinent economic and social conditions. These data will be made available to dentists making inquiry concerning location possibilities. In addition, Dr. Craig has outlined a program for returning dentists, covering suggestions as to the type of announcement that they may ethically use, establishment of a loan fund, assistance in obtaining or locating equipment and development of an industrial diagnostic program to increase the demand for dental service.

At the suggestion of LeRoy M. Ennis, president of the Pennsylvania State Dental Society, other district societies are undertaking similar dental surveys.

The Committee on Economics heartily suggests the development of similar programs by other component societies. By their efforts, they will be rendering invaluable service to their colleagues in the armed forces, to their own communities and to the dental profession as a whole. With a knowledge of the makeup of the community, the society will be in a position to determine the extent to which it is succeeding in its basic duty of providing dental service to as many of the population as possible. If it becomes apparent upon the basis of the data compiled that a large number of its dentists are well along in age, might it not be worth while to encourage the location of one or more younger dentists?

Such a survey must of necessity be adapted to the conditions of the area concerned. In a state which has a few medium-sized communities and a sprinkling of small towns, the state dental society might very readily sponsor and carry on the entire project. On the other hand, in a state with one or more large cities, the survey would of necessity require different organization and form. In the case of a populous industrial area, it would be of value to study the distribution of dentists within the locality, and to ascertain the needs of the outlying areas and suburbs, which generally are growing in population. In such instances, it might be possible for district societies to undertake local surveys and to call upon chambers of commerce, sales research organizations and university schools of business or departments of sociology to assist in carrying out the survey, evaluating the mass of information and interpreting social and ecologic trends.

A number of other sources of assistance are available besides those mentioned. The state Procurement and Assignment offices now have on file basic information on all dentists who have practiced in the state. Recent developments indicate that these offices even now are beginning to function in reverse by channeling released dentists to locations where they are needed. The information available among the mem-

bers of the dental society will also be of major value. Beyond these, it is suggested that state and local departments of dental health and dental trades organizations can assist in evaluating dental manpower, facilities and needs. The United States Bureau of the Census and the Department of Commerce are sources of basic information on population and economic trends. Additional important sources are the postwar planning groups sponsored in the various states and communities by civic bodies, chambers of commerce and other organizations. Participation in these by the component society will result in two benefits: The dental society will be in a position to guide the group in its thinking about postwar health programs and development of facilities, such as industrial, school and other public programs; and, in turn, the dental society will be in contact with a valuable source of information concerning the area—the status of its economy, postwar prospects and many other data.

PLANS OF COMMITTEE ON ECONOMICS

For some time, the Committee on Economics has been compiling basic information on the economic aspects of dental practice. Among its accomplishments during the last three years have been the preparation of an extensive report on the income of the dental profession, a study of the distribution of dentists and surveys of dental internship and industrial dental programs. It also assisted in the organization of the American Association of Industrial Dentists. Since the first rumblings of peacetime mobilization, it has been concerned with changes in the civilian economy, participating in a study of trends in hours of work, reporting on the rises in costs of dental practice and maintaining current information on the depletion of civilian dentists. At the present time, it is engaged in a survey of the status of dental programs during the war period in the schools of this country.

In recent months, as the world conflict began to reach a climax, the Committee on Economics turned its attention to ways and means by which it could be of greater assistance to the profession. Preliminary discussions of the postwar problems made it increasingly apparent that the broad program of economic research in past years would serve as a sound foundation for future planning. The material compiled earlier will serve as a basic frame of reference, within which recent changes might be analyzed and evaluated more readily. The Committee on Economics therefore has outlined a program for the coming year which will revolve around the problems of the dentist, whether he be serving in the armed forces or in civilian life. It is now at work summarizing its previous findings and compiling additional data. It contemplates publication at the appropriate time of a general report or a series of reports covering the most vital questions with which the dentist will be concerned in the postwar period. This report will summarize essential information on the national and regional level concerning economic trends in relation to the opportunities for practice, new fields, reciprocity, training and other pertinent subjects.

Such a report will not provide a mathematical formula for the solution of the economic problems of the profession. Neither would it be humanly possible to compile and report in detailed form on the economic status of every locality in this country, or to chart the potential demand for professional service in each locality. Only the component dental societies can carry out these functions for their members.

The committee also will be concerned in the coming year with problems in the field of practice management. At the present time, it is engaged in the

preparation of a report concerning financial security programs for the individual dentist. It is intended to serve as a basic guide for dentists in evaluating their current programs, as well as in outlining the essentials of sound programs of life, annuity and professional liability insurance for those who have not yet organized such programs. Further reports are contemplated concerning the establishment of fees in relationship to costs of practice, a simplified bookkeeping system and a study of the time required to perform various dental operations.

CONCLUSION

The dental profession through its organized bodies is giving serious consideration to the problems which will face it during the period of readjustment, and is making progressive plans for dental service in the subsequent period of peace. The major problems under intensive study at present include those of providing a more equitable distribution of dental health service, assistance to dentists returning from the armed forces and expansion of educational and operative programs for certain groups. Because of the vital part which local societies can play, the Committee on Economics urges local dental groups to undertake a postwar survey and planning program, and to organize methods and means of assisting dentists to reestablish themselves. Its assistance will be available to societies and individuals organizing such surveys and in channeling inquiries on special phases of such projects. It will have available shortly an outline of a postwar planning program, with suggestions as to sources of information, procedure and other details.

Being an integral part of our modern society, dentistry will be influenced by what happens to other parts of our national economy. By participating in a broad postwar planning program with other groups, it will come into more intimate contact with the thinking and planning of other leaders and will provide proper emphasis for aspects dealing generally with health care and specifically with dental care.

L. M. FITZGERALD, *Chairman*
J. E. BAGDONAS, *Secretary*

COMMITTEE ON LEGISLATION

INJURY TO DENTIST IN USE OF X-RAYS AS CAUSED BY ACCIDENTAL MEANS WITHIN INSURANCE POLICY

LESLIE CHILDS, Indianapolis, Ind.

The question of whether injury to a dentist, resulting from the use of x-ray equipment, will be deemed to have been caused by accidental means within insurance coverage is one of several angles. If the injury suffered is sudden, with disability immediately following, there would, it seems, rarely be any question of its accidental character; but if the injury results from the use of such equipment over a period of time, grave doubts of its coverage may arise. Each case of this kind will turn upon the facts, the wording of the policy involved and the jurisdiction in which the cause arises; for the courts are not in accord on the question.

Consequently, the subject cannot be covered by the statement of any hard and fast rule. However, as illustrations of judicial reasoning thereon, in situations in which x-ray injuries long in cumulating were held to have been caused by accidental means, the following will serve.

DENTIST SUFFERS INJURY FROM USE OF X-RAYS

In King *vs.* Travelers Insurance Co., 123 Conn. 1, 192 Atl. 311, the plaintiff, a dentist, carried three accident policies. The latter varied somewhat in their terms, but, so far as is material here, covered the plaintiff "against loss resulting from bodily injuries, effected directly and independently of all other causes, through external, violent and accidental means."

Upon a certain date, ulcers appeared upon the fingers of the plaintiff. These resulted from the long use by the plaintiff of x-rays in treating his patients, and the plaintiff sued for partial disability under his insurance contracts. The defendant denied liability on the grounds that the injuries received were not effected through accidental means within the coverage. In denying this contention, and in approving a judgment for the plaintiff, the higher court reasoned:

> The insured used the x-ray machine for the purpose of diagnosis in his profession, and was skilled in the use of the apparatus. The jury might well have found that what caused the ulceration to appear upon his forefingers was exposure of these fingers to the x-ray a number of times, the cumulative effect of which was to cause the breakdown of the tissue and the appearance of the ulcers. . . .
>
> The jury might reasonably have found that there was a casual connection between the x-ray burns and the ulcerations, and that the plaintiff suffered a loss resulting from bodily injuries effected directly and independently of all other causes through accidental means, or, as stated in some of the policies, through violent and accidental means. . . .
>
> The jury could reasonably have found that after the continued day by day exposure of his fingers to the destructive force of the x-ray at first made them sore from the incipient over-dose, the actual breakdown of tissue evidenced by ulcers, which ensued a few days later as a cumulative result following the subsequent exposures, marked the date of the accident. . . . There is no error.

So much for the foregoing case. A like conclusion was reached in Murphy *vs.* Travelers Insurance Co., 141 Neb. 41,

2 N.W. 2d 576, under similar facts and circumstances.

FACTS IN THE CASE

Here too, the plaintiff, a dentist, carried insurance "against loss . . . resulting directly, independently and exclusively of any and all other causes from bodily injury effected solely through accidental means." Here too, the plaintiff suffered injury to his left hand growing out of the continued use of x-ray equipment that required amputation of the affected parts.

The plaintiff sought to recover under his insurance policies, and the defendant resisted on the grounds that the injury was not caused by accident within the policies. The lower court found for the defendant. On appeal, the higher court in reversing the judgment, and in finding for the plaintiff, said:

> We are of the opinion that, when an unusual, unexpected, and unforeseen injury or death results from an intentional act of the insured, the ensuing injury or death is caused by accidental means, even though no mischance, slip, or mishap occurred in the doing of the act. It is the contention of the defendant that while the result was accidental in the sense that it was unintentional, it was not caused by accidental means within the purview of the language of the policy.
>
> We do not think that the attempted distinction between accidental means and accidental result can properly be made. The insured did not do anything which was ordinarily considered dangerous, although the possibility of danger was known if the practice were persisted in over a long period of time. . . . The accident was not the casual exposure of the fingers to the x-ray, but the cumulative overdose of it which was unexpected and unanticipated, and which resulted from almost daily exposure too long continued.
>
> The process of causation was unbroken and progressive from the time the cumulative effect of the exposures manifested itself until the amputation was performed. Either there was no accident at all, or there was an accident throughout. We think there was an accident throughout within the reasonable intendments of the policies. . . . The judgment . . . is reversed . . . with directions . . . to enter judgment for plaintiff.

CONCLUSION

As noted in the beginning, the courts are not in accord on the subject here involved. As illustrated herein, the courts hold that an unexpected, unforeseen injury resulting from an intentional act will be deemed to have been caused by accidental means, without the intervention of mischance or mishap.

Other courts have taken the position that when an unexpected or unforeseen injury results from an intentional act, it must appear that the means employed was accidental, or that some mischance occurred in its application, to make the injury one by accidental means. So far as the subject has been before the courts, the authorities appear to be about equally divided.

As to how the courts will rule in jurisdictions in which the point has not been litigated, if it arises, little can be said. The question is open. But, as examples of judicial reasoning wherein the first named rule is followed, the cases reviewed are among the clearest that the books contain.

1520 East Tenth Street.

COUNCIL ON DENTAL HEALTH

VICTORY CORPS PHYSICAL FITNESS PROGRAM
PROGRESS REPORT

THE High School Victory Corps Physical Fitness Dental Program has been inaugurated in forty states and the District of Columbia. On the national level, a considerable amount of publicity material has been prepared and distributed. The following national journals have published articles prepared by the members of the A.D.A. Committee: *Education for Victory, School Executive, Journal of the National Education Association, Channels, Journal of the American School Health Association,* JOURNAL OF THE AMERICAN DENTAL ASSOCIATION, *Hygeia, Dental Health, Bulletin of the American Association of Public Health Dentists* and the *Journal of the American Public Health Association.* Journals of the following state organizations in numerous states published articles on the program: State Teachers' Association, State Dental Society, State Board of Health, State Superintendent of Public Instruction, High School Activities, State Nursing Association, State P.T.A., Tuberculosis Association and others. Local newspapers, periodicals and other publications publicized the program in several states. Radio, posters and films were used in areas throughout the nation. A special sound film "The Student Flyer" was prepared especially for this program and 300 copies are being distributed throughout the country. The following reports have been received recently:

NEW YORK

The dental health program in Sewanhaka Central High School of Floral Park is a continuation of the program begun in the earliest grades of the elementary schools and aims at the correction of all dental defects before graduation plus adequate knowledge of mouth care. The program was designed (1) to teach attitudes and habits of dental hygiene that will bring about corrected dental health behavior and (2) to teach each child to seek dental service in the office of the private dentist and to establish the dentist-patient relationship at the earliest possible age. All of the students in the graduating class, with the exception of four boys, have had necessary dental treatment completed before graduation. The Oceanside High School in Rockville Center reports that 115 of the 121 seniors have had dental corrections completed or will have them completed as soon as the family dentists can arrange to give them appointments. In the Watertown High School, all but nine of the senior students have received corrections.

GEORGIA

The Victory Corps Dental Fitness Program in Georgia has been sponsored and promoted jointly by the State Department of Education, the Georgia Department of Public Health and the Georgia Dental Association. Authentic evaluations have not been attempted, but it appears that the program has resulted in increased interest in dental health problems at all ages and in an increase in the number of dental corrections among high school seniors. Many schools report all seniors with dental certificates. Lack of dentists has been the handicap in almost every community. Dentists have cooperated wholeheartedly, especially in their efforts to provide needed service for high school seniors. The schools reporting best results

are those that have placed emphasis on dental health and dental corrections in previous years.

OHIO

Since September 1941, special attention has been given to junior and senior high school students in thirty-three of Ohio's eighty-eight counties. The State Department of Health assisted and cooperated with the component dental societies in Cleveland, Cincinnati, Columbus, Toledo, Akron, Dayton, Canton and Youngstown. The Ohio State Dental Society, as well as each of the twenty-three components, has reorganized its committee on dental health education and has established a council on dental health.

FLORIDA

The Florida State Dental Society, the State Health Department and the State Office of Education approved the High School Victory Corps Physical Fitness Dental Program. Dentists were notified of objectives and the state superintendent of public instruction informed county school superintendents and high school principals of the project. Educational material was distributed and various types of teaching procedures were used. Information thus far available indicates that the cooperation of many of the schools was obtained and that dental health education was coordinated with other teaching subjects.

ALLEN O. GRUEBBEL,
Executive Secretary.

COUNCIL ON DENTAL EDUCATION

RESOLUTIONS PASSED BY AMERICAN ASSOCIATION OF DENTAL SCHOOLS

The following resolutions were passed by the American Association of Dental Schools at its recent annual meeting in Chicago, March 20-22, 1944.

1. *Resolved,* that this association record its approval of the basic predental requirements prescribed by the Council on Dental Education, covering two years of successful work in an accredited liberal arts college and including a year's credit in English, in biology, in physics and in inorganic chemistry and a half year's credit in organic chemistry.

2. *Resolved,* that this association record its approval of the permissive regulation in the predental requirements prescribed by the Council on Dental Education, providing for the admission of occasional students, otherwise fully qualified, from liberal arts colleges outside the jurisdiction of a regional accrediting agency and from unaccredited colleges which enjoy the approval of the state university of the state in which they are located.

3. *Resolved,* that this association record its approval, in principle, of the permissive regulation in the predental requirements prescribed by the Council on Dental Education, providing for the waiving of the requirements of biology or physics or both subjects in the admission of students with exceptionally high scholastic standing with three or more years of successful work in an accredited liberal arts college.

4. *Resolved,* that this association urge its member schools to act freely upon their own disposition and discretion, without reference to the requirements of any local or state agency, in the observance of the permissive regulation in the predental requirements prescribed by the Council on Dental Education, touching the admission of students with exceptionally high scholastic standing with three or more years of successful work in an accredited liberal arts college without credit in biology and physics or both subjects.

5. *Resolved,* that this association recognize the Council on Dental Education of the American Dental Association as the official rating agency of dental schools in America.

CARL O. FLAGSTAD,
Secretary-Treasurer,
University of Minnesota,
School of Dentistry,
Minneapolis, Minn.

DENTAL STUDENTS' REGISTER, 1943

THE series of statistical tables issued annually by the Council on Dental Education under the caption "Dental Students' Register" presents evidence of interesting trends in dental education and licensure. The several tables are compiled as of October 15, 1943.

Table 1, on *Enrollment,* shows a total undergraduate enrollment as of October 15, 1943 of 9,014. This is an increase of 167 over the previous year and is the largest in the last seventeen years. The increase is explained as follows: There were 305 sophomores and 26 seniors over the previous year and a decrease of 140 freshmen and 24 juniors. The grand total of enrollment including special, graduate and postgraduate students and dental hygiene students is 9,598.

Table 2, on *Comparative Enrollment,* shows the total undergraduate enrollment for the last ten years. The lowest enrollment in that time was 7,175 in 1934-1935. The largest enrollment this year in a single school is 538 and the lowest 40. The average in the thirty-nine dental schools is 231.

Table 3, on *Predental College Training,* shows the predental training of the 9,014 undergraduates as follows: With two years, 4,380; with three years, 1,905; with four years without a degree, 346; with a bachelor's degree, 2,275; with other degree, 108. This table also shows the predental training of the 2,562 freshmen as follows: With two years, 1,228; with three years, 599; with four years without a degree, 147; with a bachelor's degree, 566; with other degree, 22.

Table 4, on *Predental Training of Graduates,* in 1943, shows that there were 1,926 graduates for the year ending June 30, 1943 with predental training as follows: With less than two years, 4; with two years, 981; with three years, 322; with four years, without a degree, 63; with a bachelor's degree, 526; with other degree, 30.

Table 5, on *Comparative Predental Training of Graduates,* from 1937 to 1943, shows a steady increase from 1937 to 1941 from 20 to 32 per cent of graduates with predental training of a bachelor's degree or other degree. In 1942 and 1943, there was a decrease to 29 per cent for both years.

Table 6, on the *Geographical Distribution,* of the 9,014 undergraduates, shows students from every state in the Union and 91 from U. S. possessions, 34 from Canada and 56 from other foreign countries. The largest enrollment is 1,800 from New York and the smallest is 8 from Nevada.

Table 7, on *Enrollment in Schools of Dental Hygiene,* shows fifteen schools in operation (eleven in dental schools) with an enrollment of 351. During the year ending June 30, 1943, these schools granted 298 degrees or certificates.

Table 8 gives a list of the thirty-nine dental schools in the United States with the names of the deans.

Table 9 gives the dates of entering freshman classes and graduating classes under the accelerated schedule.

Table 10 gives the percentages of failures in state dental licensing examinations for the four years 1939 to 1942 by states and by dental schools.

TABLE I

Total Enrollment in the Dental Schools of the United States as of October 15, 1943

SCHOOL OR COLLEGE	UNDERGRADUATES								OTHER STUDENTS						ALL STUDENTS		
	Freshmen	Sophomores	Juniors	Seniors	Men	Women	Total	Specials	Graduates	Post Grad.	Dental Hygienists	Men	Women	Total	Men	Women	Total
CALIFORNIA																	
College of Physicians & Surgeons	57	45	43	37	180	2	182	-	-	-	-	-	-	-	180	2	182
University of California	66	39	33	50	186	2	188	15	1	-	8	14	10	24	200	12	212
University of Southern California	71	88	108	85	350	2	352	-	5	-	4	4	5	9	354	7	361
DISTRICT OF COLUMBIA																	
Georgetown University	55	40	57	46	198	-	198	-	-	-	-	-	-	-	198	-	198
Howard University	51	33	21	25	127	3	130	-	-	1	3	1	3	4	128	6	134
GEORGIA																	
Atlanta-Southern Dental College	98	87	89	102	371	5	376	-	-	-	-	-	-	-	371	5	376
ILLINOIS																	
Loyola University, Chicago	92	88	56	84	320	-	320	-	1	-	-	1	-	1	321	-	321
Northwestern University	95	102	69	70	333	3	336	-	18	6	16	24	16	40	357	19	376
University of Illinois	68	61	51	54	232	2	234	-	6	-	-	6	-	6	238	2	240
INDIANA																	
Indiana University	55	41	41	37	174	-	174	-	-	-	-	-	-	-	174	-	174
IOWA																	
State University of Iowa	20	47	29	31	126	1	127	-	1	-	-	1	-	1	127	1	128
KENTUCKY																	
University of Louisville	48	53	43	39	181	2	183	-	-	-	-	-	-	-	181	2	183
LOUISIANA																	
Loyola University, New Orleans	60	34	42	30	165	1	166	-	-	-	-	-	-	-	165	1	166
MARYLAND																	
University of Maryland	77	63	85	76	301	-	301	-	-	-	-	-	-	-	301	-	301
MASSACHUSETTS																	
*Harvard University	3	-	-	37	40	-	40	-	-	2	-	2	-	2	42	-	42
Tufts College	84	81	81	74	315	5	320	2	-	-	-	2	-	2	317	5	322
MICHIGAN																	
University of Detroit	48	34	-	13	93	2	95	-	-	-	-	-	-	-	93	2	95
University of Michigan	69	61	53	37	217	3	220	-	21	*220	27	241	27	268	458	30	488
MINNESOTA																	
University of Minnesota	75	100	81	55	308	3	311	-	-	-	52	-	52	52	308	55	363
MISSOURI																	
University of Kansas City	106	104	-	58	268	-	268	-	-	-	-	-	-	-	268	-	268
St. Louis University	115	52	77	56	300	-	300	-	-	-	-	-	-	-	300	-	300
Washington University	47	43	34	16	135	5	140	-	-	-	-	-	-	-	135	5	140
NEBRASKA																	
Creighton University	30	33	23	20	104	2	106	-	-	-	-	-	-	-	104	2	106
University of Nebraska	34	30	28	14	105	1	106	-	-	-	-	-	-	-	105	1	106
NEW YORK																	
Columbia University	52	46	50	51	196	3	199	-	-	10	14	10	14	24	206	17	223
New York University	135	131	132	140	536	2	538	-	-	23	-	23	-	23	559	2	561
University of Buffalo	65	51	-	48	164	-	164	-	-	-	-	-	-	-	164	-	164
OHIO																	
Ohio State University	53	77	57	52	239	-	239	-	-	45	-	44	1	45	283	1	284
Western Reserve University	56	50	45	32	182	1	183	-	-	-	-	-	-	-	182	1	183
OREGON																	
North Pacific College of Oregon	66	114	77	46	302	1	303	2	-	-	3	2	3	5	304	4	308
PENNSYLVANIA																	
Temple University	90	107	109	103	405	4	409	-	-	-	18	-	18	18	405	22	427
University of Pennsylvania	128	110	102	92	430	2	432	2	-	-	42	1	43	44	431	45	476
University of Pittsburgh	98	87	81	80	342	4	346	-	1	2	-	3	-	3	345	4	349
TENNESSEE																	
Meharry Medical College	25	27	16	9	74	3	77	3	-	-	-	-	3	3	74	6	80
University of Tennessee	34	42	23	26	124	1	125	-	-	-	-	-	-	-	124	1	125
TEXAS																	
Baylor University	55	61	47	38	200	1	201	-	-	-	-	-	-	-	200	1	201
University of Texas	43	51	34	31	158	1	159	-	-	-	-	-	-	-	158	1	159
VIRGINIA																	
Medical College of Virginia	47	45	34	26	151	1	152	-	-	-	-	-	-	-	151	1	152
WISCONSIN																	
Marquette University	91	105	66	52	312	2	314	-	-	-	10	-	10	10	312	12	324
TOTALS - 1943	2562	2463	2017	1972	8944	70	9014	24	54	309	197	379	205	584	9323	275	9598

*Freshmen in Harvard School of Dental Medicine

*Covers attendance throughout the year.

TABLE 2

Recapitulation of Undergraduate Enrollment in the Dental Schools of the United States, 1934-1943 Inclusive

SCHOOL OR COLLEGE	1934-1935	1935-1936	1936-1937	1937-1938	1938-1939	1939-1940	1940-1941	1941-1942	1942-1943	1943-1944
CALIFORNIA										
College of Physicians & Surgeons	142	136	141	135	151	147	151	163	164	182
University of California	140	142	159	152	179	163	168	181	168	188
University of Southern California	286	298	348	327	297	309	338	385	383	352
DISTRICT OF COLUMBIA										
Georgetown University	193	165	124	155	166	165	183	201	197	198
Howard University	35	38	37	40	45	58	72	89	121	130
GEORGIA										
Atlanta-Southern Dental College	284	301	326	299	313	318	319	351	359	376
ILLINOIS										
Loyola University, Chicago	293	272	305	269	264	259	269	274	305	320
Northwestern University	322	341	325	326	302	286	295	295	317	336
University of Illinois	125	146	162	196	220	222	224	227	228	234
INDIANA										
Indiana University	166	163	188	152	137	118	113	130	152	174
IOWA										
State University of Iowa	145	167	186	145	118	117	112	133	155	127
KENTUCKY										
University of Louisville	111	122	107	104	139	163	177	186	196	183
LOUISIANA										
Loyola University, New Orleans	133	134	165	166	177	167	154	156	145	166
MARYLAND										
University of Maryland	352	294	219	222	216	255	310	322	325	301
MASSACHUSETTS										
Harvard University	127	151	145	152	154	154	146	119	89	40*
Tufts College	258	257	240	240	249	245	257	282	308	320
MICHIGAN										
University of Detroit	127	101	95	100	114	112	106	91	96	95
University of Michigan	151	161	150	135	153	162	158	186	213	220
MINNESOTA										
University of Minnesota	275	293	302	283	242	208	197	264	300	311
MISSOURI										
University of Kansas City	231	238	241	203	207	204	240	259	297	268
St. Louis University	154	178	200	188	170	150	167	236	229	300
Washington University	139	131	122	116	120	123	90	107	121	140
NEBRASKA										
Creighton University	92	96	77	76	71	75	76	76	102	106
University of Nebraska	66	73	76	67	62	55	48	73	88	106
NEW YORK										
Columbia University	183	179	196	201	198	203	215	206	202	199
New York University	516	518	532	540	535	533	551	561	561	538
University of Buffalo	131	123	117	130	140	141	142	135	149	164
OHIO										
Ohio State University	198	207	202	193	202	209	222	235	261	239
Western Reserve University	116	121	124	132	140	162	161	172	178	183
OREGON										
North Pacific College of Oregon	153	157	191	158	167	182	171	220	303	303
PENNSYLVANIA										
Temple University	510	507	457	430	437	405	439	460	429	409
University of Pennsylvania	324	341	382	401	417	414	425	413	419	432
University of Pittsburgh	184	187	163	127	159	220	297	334	342	346
TENNESSEE										
Meharry Medical College	22	25	21	33	34	33	41	51	64	77
University of Tennessee	93	87	113	108	111	109	105	110	103	125
TEXAS										
Baylor University	107	110	125	128	134	151	144	173	190	201
University of Texas	59	65	79	80	81	81	87	112	143	159
VIRGINIA										
Medical College of Virginia	90	110	112	124	136	137	135	139	149	152
WISCONSIN										
Marquette University	142	171	145	154	175	192	215	248	296	314
ANNUAL TOTALS	7175	7306	7397	7184	7331	7407	7720	8355	8847	9014
ANNUAL AVERAGE PER SCHOOL	184	187	189	184	188	190	198	214	227	231

*Includes 3 in Harvard School of Dental Medicine

TABLE 3

Pre-dental College Training of Undergraduates in Regular Course in the Dental Schools of the United States as of October 15, 1943

SCHOOL OR COLLEGE	ALL UNDERGRADUATES						FRESHMEN					
	2 Years	3 Years	4 Years without Degree	Bachelor's Degree	Beyond Bachelor's Degree	Total	2 Years	3 Years	4 Years without Degree	Bachelor's Degree	Beyond Bachelor's Degree	Total
CALIFORNIA												
College of Physicians & Surgeons	113	35	4	23	7	182	34	13	2	6	2	57
University of California	118	27	2	36	5	188	38	13	-	13	2	66
University of Southern California	223	63	12	50	4	352	40	12	3	16	-	71
DISTRICT OF COLUMBIA												
Georgetown University	86	48	14	50	-	198	27	14	6	8	-	55
Howard University	24	27	5	74	-	130	5	13	3	30	-	51
GEORGIA												
Atlanta-Southern Dental College	242	57	7	70	-	376	60	19	3	16	-	98
ILLINOIS												
Loyola University, Chicago	194	60	8	56	2	320	50	23	5	14	-	92
Northwestern University	185	74	3	69	5	336	58	20	-	17	-	95
University of Illinois	119	56	6	50	3	234	34	15	3	14	2	68
INDIANA												
Indiana University	77	54	12	29	2	174	18	20	8	7	2	55
IOWA												
State University of Iowa	66	39	2	18	2	127	9	9	-	2	-	20
KENTUCKY												
University of Louisville	62	52	19	49	1	183	10	17	7	14	-	48
LOUISIANA												
Loyola University, New Orleans	80	33	7	45	1	166	30	10	2	17	1	60
MARYLAND												
University of Maryland	169	44	2	86	-	301	23	23	-	31	-	77
MASSACHUSETTS												
*Harvard University	16	9	-	14	1	40	-	3	-	-	-	3
Tufts College	163	61	5	82	9	320	53	10	1	19	1	84
MICHIGAN												
University of Detroit	53	18	3	20	1	95	28	10	2	8	-	48
University of Michigan	107	56	8	41	8	220	36	13	5	12	3	69
MINNESOTA												
University of Minnesota	180	93	11	20	7	311	34	26	4	8	3	75
MISSOURI												
University of Kansas City	154	42	13	56	3	268	61	16	8	20	1	106
St. Louis University	167	38	23	64	8	300	56	19	18	22	-	115
Washington University	70	25	7	36	2	140	26	13	1	7	-	47
NEBRASKA												
Creighton University	71	23	3	9	-	106	23	4	-	3	-	30
University of Nebraska	70	22	3	11	-	106	22	4	1	7	-	34
NEW YORK												
Columbia University	2	46	4	141	6	199	2	19	5	26	-	52
New York University	45	150	22	321	-	538	19	60	6	48	2	135
University of Buffalo	88	45	4	27	-	164	43	15	1	6	-	65
OHIO												
Ohio State University	129	55	9	42	4	239	30	17	-	5	1	53
Western Reserve University	65	53	21	43	1	183	34	12	1	9	-	56
OREGON												
North Pacific College of Oregon	138	71	22	65	7	303	29	16	8	13	-	66
PENNSYLVANIA												
Temple University	226	68	26	88	1	409	34	13	15	28	-	90
University of Pennsylvania	177	100	7	140	8	432	44	34	13	37	-	128
University of Pittsburgh	181	69	10	83	3	346	50	22	5	21	-	98
TENNESSEE												
Meharry Medical College	10	14	4	49	-	77	3	6	3	13	-	25
University of Tennessee	59	31	9	26	-	125	24	4	2	4	-	34
TEXAS												
Baylor University	129	34	6	29	3	201	37	14	1	3	-	55
University of Texas	88	23	8	39	1	159	27	8	2	6	-	43
VIRGINIA												
Medical College of Virginia	46	37	13	56	-	152	17	6	2	22	-	47
WISCONSIN												
Marquette University	188	53	2	68	3	314	60	14	1	14	2	91
TOTALS	4380	1905	346	2275	108	9014	1228	599	147	566	22	2562

*Includes 3 in Harvard School of Dental Medicine

TABLE 4

Pre-dental College Training of Graduates of Dental Schools in the United States for the Year ending June 30, 1943

SCHOOL OR COLLEGE	Less than 2 Years	2 Years	3 Years	4 Years without Degree	Bachelor's Degree	Other Degree	Total	Per Cent Entering with Degree	No. Graduating in Combined Courses
CALIFORNIA									
College of Physicians & Surgeons	-	22	9	-	-	1	32	3	12
University of California	-	18	7	3	2	-	30	7	28
University of Southern California	-	48	6	5	18	-	77	23	43
DISTRICT OF COLUMBIA									
Georgetown University	-	16	8	7	12	1	44	30	-
Howard University	-	4	2	2	10	-	18	55	-
GEORGIA									
Atlanta-Southern Dental College	-	46	11	5	13	-	75	17	-
ILLINOIS									
Loyola University, Chicago	2	53	6	-	7	-	68	10	-
Northwestern University	-	43	7	-	23	3	76	34	-
University of Illinois	-	31	16	-	7	-	54	13	38
INDIANA									
Indiana University	-	15	7	1	2	-	25	8	-
IOWA									
State University of Iowa	-	24	9	1	8	-	42	19	13
KENTUCKY									
University of Louisville	-	15	15	8	15	-	53	28	-
LOUISIANA									
Loyola University, New Orleans	-	28	4	-	4	-	36	11	-
MARYLAND									
University of Maryland	-	43	15	5	21	-	84	25	-
MASSACHUSETTS									
Harvard University	1	16	4	-	16	-	37	43	-
Tufts College	-	34	6	-	25	3	68	41	-
MICHIGAN									
University of Detroit	-	18	2	-	4	-	24	17	-
University of Michigan	-	20	9	-	14	2	45	36	5
MINNESOTA									
University of Minnesota	-	32	15	4	8	3	62	18	-
MISSOURI									
University of Kansas City	-	51	3	2	7	-	63	11	-
St. Louis University	-	16	3	4	10	6	39	41	16
Washington University	-	9	5	1	8	-	23	35	1
NEBRASKA									
Creighton University	-	21	-	1	3	-	25	12	6
University of Nebraska	1	9	1	-	3	-	14	21	8
NEW YORK									
Columbia University	-	-	15	-	37	1	53	72	2
New York University	-	7	50	3	74	1	135	56	21
University of Buffalo	-	21	8	-	10	-	39	26	-
OHIO									
Ohio State University	-	28	14	2	20	1	65	32	2
Western Reserve University	-	15	13	4	10	-	42	24	15
OREGON									
North Pacific College	-	28	3	-	17	-	48	35	-
PENNSYLVANIA									
Temple University	-	67	5	-	22	-	94	23	-
University of Pennsylvania	-	33	10	3	36	-	82	44	-
University of Pittsburgh	-	38	13	-	17	5	73	30	7
TENNESSEE									
Meharry Medical College	-	2	-	-	6	-	8	75	-
University of Tennessee	-	18	-	-	7	1	26	31	-
TEXAS									
Baylor University	-	32	2	-	5	-	39	13	5
University of Texas	-	15	2	2	3	2	24	21	-
VIRGINIA									
Medical College of Virginia	-	10	8	-	7	-	25	28	4
WISCONSIN									
Marquette University	-	35	9	-	15	-	59	25	5
TOTALS	4	981	322	63	526	30	1926	29	231

TABLE 5

Graduates with Pre-dental College Training of Bachelor's Degree or Beyond in the Dental Schools of the United States, 1937 to 1943 Inclusive

SCHOOL OR COLLEGE	1937		1938		1939		1940		1941		1942		1943		
	Total No.	No. with Degree	Total No.	No. with Degree	Total No.	No. with Degree	Total No.	No. with Degree	Total No.	No. with Degree	Total No.	No. with Degree	Total No.	No. with Degree	Per Cent with Degree
CALIFORNIA															
College of Physicians & Surgeons	33	18	36	10	18	3	36	9	27	4	33	1	32	1	3
University of California	32	12	30	21	37	17	38	4	27	11	30	4	30	2	7
University of Southern California	54	10	72	20	65	16	71	10	75	6	46	9	77	18	23
DISTRICT OF COLUMBIA															
Georgetown University	18	2	29	9	45	12	25	9	41	20	44	13	44	13	30
Howard University	11	1	7	1	7	4	7	4	10	7	17	14	18	10	55
GEORGIA															
Atlanta-Southern Dental College	64	5	64	3	69	11	110	14	52	16	70	21	75	13	17
ILLINOIS															
Loyola University, Chicago	60	-	64	-	75	7	80	5	43	4	55	6	68	7	10
Northwestern University	85	20	99	30	108	13	75	27	80	21	90	16	76	26	34
University of Illinois	21	19	29	25	37	31	58	12	48	9	54	13	54	7	13
INDIANA															
Indiana University	45	4	43	5	46	2	44	1	18	3	19	5	25	2	8
IOWA															
State University of Iowa	44	1	46	2	45	1	38	-	16	3	16	3	42	8	19
KENTUCKY															
University of Louisville	40	8	8	1	27	8	28	10	41	16	37	10	53	15	28
LOUISIANA															
Loyola University, New Orleans	36	1	38	2	35	6	46	3	27	4	43	9	36	4	11
MARYLAND															
University of Maryland	73	3	66	4	63	4	15	5	74	20	62	15	84	21	25
MASSACHUSETTS															
Harvard University	24	11	33	13	29	10	39	21	33	16	38	16	37	16	43
Tufts College	64	13	51	17	64	24	57	28	63	23	56	22	68	28	41
MICHIGAN															
University of Detroit	37	11	14	3	16	-	23	2	29	7	32	5	24	4	17
University of Michigan	49	8	24	5	33	7	35	9	34	10	29	11	45	16	36
MINNESOTA															
University of Minnesota	87	-	92	9	100	13	75	7	13	4	52	7	62	11	18
MISSOURI															
University of Kansas City	44	10	60	9	67	8	44	2	25	7	50	10	63	7	11
St. Louis University	38	5	63	12	53	6	32	1	25	8	58	12	39	16	41
Washington University	25	1	31	3	20	1	37	6	25	4	26	3	23	8	35
NEBRASKA															
Creighton University	28	-	18	-	24	4	13	2	18	3	12	2	25	3	12
University of Nebraska	11	-	19	2	18	4	18	5	10	2	12	3	14	3	21
NEW YORK															
Columbia University	45	35	46	44	51	47	44	29	53	30	49	39	53	38	72
New York University	117	37	121	34	128	57	121	64	119	88	127	64	135	75	56
University of Buffalo	35	13	29	9	34	17	50	28	43	15	44	18	39	10	26
OHIO															
Ohio State University	58	6	40	3	55	-	42	7	41	9	45	13	65	21	32
Western Reserve University	23	13	28	13	28	17	35	17	44	14	33	12	42	10	24
OREGON															
North Pacific College of Oregon	36	5	35	4	39	-	62	7	25	10	30	8	48	17	35
PENNSYLVANIA															
Temple University	127	-	120	3	114	3	84	8	95	16	131	17	94	22	23
University of Pennsylvania	79	19	72	19	98	27	90	40	115	46	94	47	82	36	44
University of Pittsburgh	70	34	40	21	20	6	33	10	46	20	74	27	73	22	30
TENNESSEE															
Meharry Medical College	4	3	5	1	5	1	5	3	9	7	11	5	8	6	75
University of Tennessee	20	2	21	3	20	-	35	11	15	1	27	8	26	8	31
TEXAS															
Baylor University	26	4	32	1	27	3	35	5	25	3	34	4	39	5	13
University of Texas	11	1	19	1	17	-	31	3	11	3	18	6	24	5	21
VIRGINIA															
Medical College of Virginia	22	1	16	2	31	6	23	5	34	9	31	8	25	7	28
WISCONSIN															
Marquette University	43	16	44	19	25	6	23	12	39	8	55	15	59	15	25
TOTALS	1739	352	1704	383	1794	402	1757	445	1568	507	1784	521	1926	556	29
Per Cent with Degree		20		22		22		25		32		29			

Distribution of Undergraduate Students by States, United States

	Alabama	Arizona	Arkansas	California	Colorado	Connecticut	Delaware	Dist. of Columbia	Florida	Georgia	Idaho	Illinois	Indiana	Iowa	Kansas	Kentucky	Louisiana	Maine	Maryland	Massachusetts	Michigan
CALIFORNIA																					
College of Physicians & Surgeons				132	1				1		1	1		2	2				1		2
University of California		1		173	1	1					2									1	
University of Southern California		18		202	12	2			1		12	3	2	3							4
DISTRICT OF COLUMBIA																					
Georgetown University		1				19		44	2			1			1			4	7	12	
Howard University	7		3			1	1	5	9	5		2				3	6		4	4	
GEORGIA																					
Atlanta-Southern Dental College	56	1	1	2	1	1		2	48	90		1	2		1		2		8	3	1
ILLINOIS																					
Loyola University, Chicago				1	1	9			4		1	233	10	1					1	3	18
Northwestern University	1	1			7	3		2	12	2	6	139	15			1	2	1		7	20
University of Illinois				2		1						175		1	1		1		1		1
INDIANA																					
Indiana University						8			2				134			1			1	1	3
IOWA																					
State University of Iowa					1	1					1	5		106				3			
KENTUCKY																					
University of Louisville	2		1						6	1		1	11			80		1		3	1
LOUISIANA																					
Loyola University, New Orleans	8		1	1					9			4					91				
MARYLAND																					
University of Maryland						37	2	5	2									2	54	24	
MASSACHUSETTS																					
*Harvard University						4						1						2		24	
Tufts College						29					1							22		171	
MICHIGAN																					
University of Detroit			1									1									87
University of Michigan	1	2			1				1	1		2	2	1						1	156
MINNESOTA																					
University of Minnesota				6					1		1			1							1
MISSOURI																					
University of Kansas City	1		5		16			1			6	1			76					1	2
St. Louis University	6	1	4		2	12		1	2		2	34	5	7		3		1		10	2
Washington University	1		11	5	2	3					5	22			3	1				2	
NEBRASKA																					
Creighton University					5						1	3		24	3						6
University of Nebraska				2	14							1		4	1					2	2
NEW YORK																					
Columbia University				1		4												4		4	
New York University																				2	
University of Buffalo						1														2	
OHIO																					
Ohio State University						1							1			1					1
Western Reserve University		1			1	1		1	1											1	5
OREGON																					
North Pacific College of Oregon		1		23	3						13									1	
PENNSYLVANIA																					
Temple University						12	5	2	1			2							2	14	3
University of Pennsylvania						18	6											2	2	16	2
University of Pittsburgh				1		4		1					1							11	2
TENNESSEE																					
Meharry Medical College	4		3		1			2	2	3		2				2	6		4		5
University of Tennessee	6		11						1		1						2				
TEXAS																					
Baylor University	1		8								1						1				
University of Texas		1	1	1					1	1		1				1	7				
VIRGINIA																					
Medical College of Virginia		1				2	1		1											1	
WISCONSIN																					
Marquette University						1						6	1	4						1	13
TOTALS	94	29	50	552	69	176	15	66	107	103	54	641	184	154	88	93	118	42	85	322	340

*Includes 3 in Harvard School of Dental Medicine

TABLE 6

Territories as of Octo

	Minnesota	Mississippi	Missouri
		1	3
		1	
		2	1
		16	
	1		1
	7	3	1
	1	2	
	1		
		1	1
		8	1
	257		
	1		61
	3		70
	1		31
	6		1
	1		

TABLE 6

Territories and Foreign Countries in the Dental Schools of the as of October 15, 1943

Minnesota	Mississippi	Missouri	Montana	Nebraska	Nevada	New Hampshire	New Jersey	New Mexico	New York	North Carolina	North Dakota	Ohio	Oklahoma	Oregon	Pennsylvania	Rhode Island	South Carolina	South Dakota	Tennessee	Texas	Utah	Vermont	Virginia	Washington	West Virginia	Wisconsin	Wyoming	U.S. Possessions	Canada	Other Foreign Countries	Total
			1	1	4				1			1	1	6	1					3	7			5					2	6	182
					2			1										1			1			2					1	1	188
	1	3	3						4	2		1	1		1	1			1			45	3		7	1	3	1	6	3	6	352
	1						2	15	1	56			1			6	5						2	14		1			3			198
	2	1						3		10	14		1	1		6		7			8			11		1	1		4		10	130
	16							2		2	81		3			2		37		5	2					3	2		1			376
1		1	1				1	2		5		2	7		1	1	1					1				1	10		1	2		320
7	3	1	4	1			1		1	1	3	2	12	3		7	1	1	3	3	3	15		2	5	13	11		7	1	6	336
1	2							7		34						3			1								1		1		1	234
								6		8			4			1										2			3			174
1										4		1		1													1		1		1	127
	1	1								16	4		7				1	2		24	2			1		14	1		2			183
	8	1						2		4	1		1							3	17				1	2			11		1	166
							4	43		63	8					7	17	2					3	2		15			11			301
							4										4						1									40
							16	7		40							27						4							1	2	320
87										1			1			1														3		95
155			1				1			16			11			1				1		2	1		1	2			1		4	220
1	237		4	1				3		7		24			1			6								1	12	1	1	1	2	311
2	1	61		2					1	6		2		60		1					6	7					2	10			268
2	3	70						24		60			8	1	1	2	13		1		7	1		1		2	1		6		7	300
	1	31	1					4		15				8			2		1	1	8	2			2	2	1		5		1	140
6		1	7	33						1				2					8		1	2	1		1		3	2	1		1	106
1				59				1		3		2		1					3		3	1			2		1	3				106
								18		164						1	2									1						199
								33		503																						538
								2		157						1										1						164
1								2		25			204								1					2					1	239
5								7		57			103			2										2	1					183
			10	1	2						1	2			111			1			1	15			89			2	5	20	2	303
3						1	70			128						164	4												1			409
2						1	85			187	2		1			94	5				2		2	3			1		1		2	432
2							18			135			14			125										32	1		1			340
5	3	1						7		4			2			2	1	4		7	5			2		1			2		2	77
	31									1	4			2				1		62	2			1								125
									5					31					1		152								1			201
	1									2				5							136					1						159
								5		15	48		1			1		7					62			7						152
13	7		6					3		67		2	3			2			1	1					1	2	188		5			314
340	266	69	172	38	98	8	31	370	12	1800	166	38	386	116	121	432	83	61	28	107	359	99	17	99	116	109	239	11	91	34	56	9014

TABLE 7

Schools of Dental Hygiene

Title of School or Course	Institution with which Connected	Admission Requirement	Length of Course	Enrollment 10/15/43	Graduates Year Ending 6/30/43	Degree or Certificate
Curriculum for the Training of Dental Hygienists	College of Dentistry University of California San Francisco	2 Years in Liberal Arts	2 Years	8	5	B.S. in Dental Hygiene
Division of Dental Hygiene	College of Dentistry University of Southern California, Los Angeles	2 Years in Liberal Arts	2 Years	4	4	B.S. in Dental Hygiene
Course for Dental Hygienists	College of Dentistry Howard University Washington, D.C.	High School Course	1 Year	3	4	Certificate
Course for Dental Hygienists and Dental Assistants	Dental School Northwestern University Chicago, Illinois	High School Course	2 Years	16	11	Certificate
Curriculum in Dental Hygiene	School of Dentistry University of Michigan Ann Arbor	High School Course	2 Years	27	14	Certificate
Course for Dental Hygienists	School of Dentistry University of Minnesota Minneapolis	High School Course	2 Years	52	36	Graduate Dental Hygienist (GDH)
Courses for Dental Hygienists	School of Dental and Oral Surgery, Columbia University New York City	High School Course	1 Year	14	23	Certificate
Courses for Dental Assistants and Dental Hygienists	School of Dentistry North Pacific College of Oregon, Portland	High School Course	1 Year 2 Years	3	7	Certificate
School of Oral Hygiene	School of Dentistry Temple University Philadelphia	High School Course or 3 Years in Teachers' College	1 Year 1 Year	18	10	Certificate B.S. in Education with Certificate in Oral Hygiene
Courses in Oral Hygiene	School of Dentistry University of Pennsylvania Philadelphia	High School Course	1 Year 4 Years	42	30	Certificate B.S. in Education with Certificate in Oral Hygiene
*School of Dental Hygiene	College of Dentistry University of Tennessee Memphis	High School Course	2 Years	0	5	Certificate
Curriculum for Dental Hygienists	Dental School Marquette University Milwaukee, Wisconsin	High School Course	2 Years	10	16	Certificate
Forsyth Training School for Dental Hygienists	Forsyth Dental Infirmary Boston, Massachusetts	High School Course	Eleven Months	52	46	Certificate
School for Dental Hygienists	Eastman Dental Dispensary Rochester, New York	High School Course	1 Year	50	35	Certificate
Department of Dental Hygiene	West Liberty State College West Liberty, W. Va.	High School Course	2 Years 2 Additional Years	12	8	Certificate B.S. in Oral Hygiene
School for Dental Hygienists	The Murry and Leonie Guggenheim Dental Clinic New York City	High School Course	1 Year	40	44	Certificate
TOTAL				351	298	

*Temporarily discontinued

TABLE 8

Administrative Officers of the Dental Schools of the United States

SCHOOL OR COLLEGE	LOCATION	DEAN
CALIFORNIA		
College of Physicians & Surgeons	San Francisco, California	Ernest G. Sloman
University of California	San Francisco, California	Willard C. Fleming
University of Southern California	Los Angeles, California	Lewis E. Ford
DISTRICT OF COLUMBIA		
Georgetown University	Washington, D.C.	Roy J. Glezen, Asst. Dean
Howard University	Washington, D.C.	Russell A. Dixon
GEORGIA		
Atlanta-Southern Dental College	Atlanta, Georgia	Ralph R. Byrnes
ILLINOIS		
Loyola University, Chicago	Chicago, Illinois	R. W. McNulty, Acting Dean
Northwestern University	Chicago, Illinois	Charles W. Freeman
University of Illinois	Chicago, Illinois	Howard M. Marjerison
INDIANA		
Indiana University	Indianapolis, Indiana	William H. Crawford
IOWA		
State University of Iowa	Iowa City, Iowa	Alvin W. Bryan
KENTUCKY		
University of Louisville	Louisville, Kentucky	John T. O'Rourke
LOUISIANA		
Loyola University, New Orleans	New Orleans, Louisiana	Sydney L. Tiblier
MARYLAND		
University of Maryland	Baltimore, Maryland	J. Ben Robinson
MASSACHUSETTS		
Harvard University	Boston, Massachusetts	A. LeRoy Johnson, Executive Officer
Tufts College	Boston, Massachusetts	Basil G. Bibby
MICHIGAN		
University of Detroit	Detroit, Michigan	Leo A. Cadarette
University of Michigan	Ann Arbor, Michigan	Russell W. Bunting
MINNESOTA		
University of Minnesota	Minneapolis, Minnesota	William F. Lasby
MISSOURI		
University of Kansas City	Kansas City, Missouri	Roy J. Rinehart
St. Louis University	St. Louis, Missouri	Thomas E. Purcell
Washington University	St. Louis, Missouri	Benno E. Lischer
NEBRASKA		
Creighton University	Omaha, Nebraska	Frank J. Viner
University of Nebraska	Lincoln, Nebraska	Bert L. Hooper
NEW YORK		
Columbia University	New York City	Willard Cole Rappleye H. Holliday, Associate
New York University	New York City	Allen T. Newman
University of Buffalo	Buffalo, New York	R. W. Groh
OHIO		
Ohio State University	Columbus, Ohio	Wendell D. Postle
Western Reserve University	Cleveland, Ohio	William L. Wylie
OREGON		
North Pacific College of Oregon	Portland, Oregon	Herbert C. Miller, President and Acting Dean
PENNSYLVANIA		
Temple University	Philadelphia, Pennsylvania	Gerald D. Timmons
University of Pennsylvania	Philadelphia, Pennsylvania	J. L. T. Appleton
University of Pittsburgh	Pittsburgh, Pennsylvania	H. Edmund Friesell
TENNESSEE		
Meharry Medical College	Nashville, Tennessee	M. Don Clawson, Director
University of Tennessee	Memphis, Tennessee	R. D. Dean
TEXAS		
Baylor University	Dallas, Texas	Philip Knutzen, Acting Dean
University of Texas	Houston, Texas	Frederick C. Elliott
VIRGINIA		
Medical College of Virginia	Richmond, Virginia	Harry Bear
WISCONSIN		
Marquette University	Milwaukee, Wisconsin	George W. Wilson

TABLE 9

Dates of Entering Freshman Classes and Graduating Classes in the Dental Schools in the United States

	1944		1945	
	Freshmen Admitted	Classes Graduated	Freshmen Admitted	Classes Graduated
CALIFORNIA				
College of Physicians & Surgeons	Apr.17	Jan.12	Jan.19	July
University of California	July	June	Mar. 1	Feb., Oct.
University of Southern California	July 10	July 22	Mar.12, Nov.12	June 2, Nov. 24
DISTRICT OF COLUMBIA				
Georgetown University	Jan. 3, Oct.	Oct.	June	June
Howard University	Mar.25	Mar.17, Dec. 22	Jan. 3, Sept.24	Sept. 3
GEORGIA				
Atlanta-Southern Dental College	Jan. 5, Oct. 4	Aug. 30	June 27	May 30
ILLINOIS				
Loyola University, Chicago	June 26, Sept.25	Mar.31, Oct. 1	June 25, Oct. 1	June 15, Oct. 1
Northwestern University	Mar. 27	June 14, Sept.	Jan. 3, Sept.	June, Sept.
University of Illinois	Apr. 3	Mar.24, Dec.23	Jan. 2	Sept.
INDIANA				
Indiana University	Apr.28	Apr.22, Dec.20	Jan. 2	Aug.
IOWA				
State University of Iowa	Jan. 3, Oct. 2	Apr.23	July 2	June 16
KENTUCKY				
University of Louisville	Jan. 3, Sept.25	Aug.19	June 25	June 2
LOUISIANA				
Loyola University, New Orleans	June 5	May 19	Feb. 5, Oct. 8	Jan.20, Sept.21
MARYLAND				
University of Maryland	Jan. 4, Sept.26	Aug. 1	June 19	June 1
MASSACHUSETTS				
Harvard University	Jan. 3, Oct. 1	Mar.15	July	None
Tufts College	Jan., Oct.	Sept.	July	June
MICHIGAN				
University of Detroit	June 5	May 31	Feb. 1	June 1
University of Michigan	Nov. 1	Feb. 26, June 24	Oct. 30	June
MINNESOTA				
University of Minnesota	Mar.27	Aug. 25	Jan. 3	Aug.
MISSOURI				
University of Kansas City	June 5	June 4	Feb., Sept.	June
St. Louis University	Aug. 28	Aug. 26	May 29	May 26
Washington University	Mar. 25	Sept. 17	Jan. 2, Sept.22	Sept.23
NEBRASKA				
Creighton University	Jan. 4, Sept.	Sept. 28	July 9	June 7
University of Nebraska	Sept. 14	Jan. 31, Aug. 21	Sept.	Aug.
NEW YORK				
Columbia University	Jan. 1, Oct. 2	Sept.	July 2	June
New York University	Jan. 3, Oct. 2	Sept. 23	July 2	June 23
University of Buffalo	Apr. 3	June	Jan.	June
OHIO				
Ohio State University	Jan. 4, Sept.12	Sept. 1	June	June
Western Reserve University	Aug. 28	Sept.13	June 25	June 10
OREGON				
North Pacific College of Oregon	Mar. 1, Nov. 1	June 27, Oct. 31	July 5	June 26
PENNSYLVANIA				
Temple University	Aug. 1	June 30	June	May
University of Pennsylvania	Jan. 3, Oct.	Sept.	June	May
University of Pittsburgh	June 1	May	Feb. 1	Jan.
TENNESSEE				
Meharry Medical College	Mar.27, Dec.27	Mar. 19, Dec.	Sept.	Sept.
University of Tennessee	Jan. 3, June 26	Sept. 20	Jan. 1, July 5	June 10, Dec. 15
TEXAS				
Baylor University	Apr. 3	Mar. 14, Nov. 27	Jan.	Not determined
University of Texas	Mar. 20	Sept. 18	Jan. 2, Sep. 24	Sept. 24
VIRGINIA				
Medical College of Virginia	Oct. 4	Sept.	June	June
WISCONSIN				
Marquette University	Mar. 1, Nov. 1	July 1	July 1	July 1

TABLE 10

Percentages of Failures in Licensing Examinations, 1939, 1940, 1941, 1942

STATES	BOARDS 1939	1940	1941	1942	Average for 4 Years
Alabama	16	10	22	0	12.
Arizona	70	60	40	58	57.
Arkansas	20	12	25	0	14.2
California	21	18	12	6	14.2
Colorado	24	10	8	0	10.5
Connecticut	13	16	18	23	17.5
Delaware	69	55	25	50	49.7
District of Columbia	56	55	50	48	52.2
Florida	44	49	35	33	40.2
Georgia	24	18	0	0	10.5
Idaho	50	29	40	16	33.7
Illinois	7	5	9	7	7.
Indiana	9	7	13	4	8.2
Iowa	8	5	4	2	4.7
Kansas	0	0	28	0	7.
Kentucky	22	11	0	0	8.2
Louisiana	0	0	0	0	0
Maine	0	8	0	0	2.
Maryland	6	13	23	19	15.2
Massachusetts	3	3	3	3	3.
Michigan	25	10	15	9	14.7
Minnesota	1	3	8	2	3.5
Mississippi	5	13	0	0	4.5
Missouri	18	7	13	4	10.5
Montana	35	28	0	0	15.7
Nebraska	9	18	23	0	12.5
Nevada	40	100	16	13	42.2
New Hampshire	30	7	75	10	30.5
New Jersey	51	41	35	41	42.
New Mexico	72	42	0	23	34.2
New York	21	15	11	6	13.2
North Carolina	30	35	32	12	27.2
North Dakota	0	0	0	0	0
Ohio	5	7	7	10	7.2
Oklahoma	0	19	14	10	10.7
Oregon	15	24	30	20	22.2
Pennsylvania	6	1	9	0	4.
Rhode Island	0	0	0	0	0
South Carolina	47	24	13	13	24.2
South Dakota	29	0	100	0	32.2
Tennessee	0	16	50	0	16.5
Texas	37	31	32	14	28.5
Utah	16	0	0	6	5.5
Vermont	44	25	0	28	24.2
Virginia	13	15	2	0	7.5
Washington	55	39	53	12	39.7
West Virginia	6	18	9	10	10.7
Wisconsin	5	0	4	0	2.2
Wyoming	50	0	50	57	39.2

SCHOOL OR COLLEGE	INSTITUTIONS 1939	1940	1941	1942	Average for 4 Years
College of Physicians & Surgeons	9	3	7	0	4.7
University of California	11	0	0	0	2.7
University of Southern California	10	8	2	2	5.5
Georgetown University	37	35	25	23	30.
Howard University	34	33	20	17	26.
Atlanta-Southern Dental College	27	20	13	4	16.
Loyola, Chicago	13	14	18	12	14.7
Northwestern University	20	23	17	8	17.
University of Illinois	23	13	11	7	13.5
Indiana University	13	12	18	9	13.
State University of Iowa	15	11	11	2	9.7
University of Louisville	28	20	10	9	16.7
Loyola University, New Orleans	15	18	15	5	13.2
University of Maryland	16	35	21	10	20.5
Harvard University	5	0	12	7	6.
Tufts College	12	10	9	8	9.7
University of Detroit	24	11	10	0	11.2
University of Michigan	24	15	16	19	18.5
University of Minnesota	6	6	21	9	10.5
University of Kansas City	17	23	27	8	18.7
St. Louis University	28	27	20	8	20.7
Washington University	27	10	24	9	17.5
Creighton University	15	17	22	5	14.7
University of Nebraska	30	20	18	15	20.7
Columbia University	7	4	7	11	7.2
New York University	16	13	7	7	10.7
University of Buffalo	20	9	4	12	11.2
Ohio State University	16	6	11	10	10.7
Western Reserve University	20	14	10	17	15.2
North Pacific College of Oregon	35	27	25	7	23.5
Temple University	27	28	20	8	20.7
University of Pennsylvania	17	21	13	13	16.
University of Pittsburgh	19	15	22	13	17.2
Meharry Medical College	66	62	39	4	42.7
University of Tennessee	13	6	41	2	15.5
Baylor University	17	16	12	2	11.7
University of Texas	25	6	23	0	13.5
Medical College of Virginia	17	22	4	9	13.
Marquette University	21	21	6	8	14.
Canadian Dental Schools	37	32	19	31	29.7
Other Foreign Dental Schools	100	43	100	50	73.2
Extinct and Unknown Dental Schools	61	56	70	50	59.2

DEATHS

AKERS, LORAN P., Des Moines, Iowa; Northwestern University Dental School, 1899; died May 12; aged 71.

BATES, C. G., Durand, Mich.; University of Michigan, College of Dental Surgery, 1897; died May 1; aged 67.

BOYLE, ELVIN S., Port Deposit, Md.; University of Maryland, School of Dentistry and the Baltimore College of Dental Surgery, 1891; died April 8; aged 78.

BROSMAN, W. H., Albion, Ill.; died May 7.

CHASE, CHARLES, Dixon, Ill.; died April 12; aged 90.

CLARK, FRANK T., Easton, Pa.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1892; died May 17; aged 74.

CLEVELAND, THOMAS HILBURN, Anniston, Ala.; Vanderbilt University, School of Dentistry, 1917; died May 5.

COLLINS, JOHN J., St. Louis, Mo.; St. Louis University School of Dentistry, 1919; died April 16; aged 47.

COWEN, WILLIAM E., Detroit, Mich.; Detroit College of Medicine, Department of Dental Surgery, 1895; died May 8; aged 72.

CRARY, E. J., Choteau, Mont.; Northwestern University Dental School, 1906; died April 16; aged 60.

CRAVEN, EDGAR ALLEN, Alhambra, Calif.; University of Southern California, College of Dentistry, 1911; died April 17; aged 56.

DATZ, WILLIAM F., Chicago, Ill.; Chicago College of Dental Surgery, Dental School, Loyola University, 1922; died April 20; aged 46.

DAVIS, CHARLES F., Aurora, Ill.; Northwestern University Dental School, 1913; died May 4; aged 49.

DOUD, CHESTER A., Fulton, Ind.; died April 30; aged 59.

ENGLUND, ELVIN F., Willmar, Minn.; University of Minnesota, College of Dentistry, 1915; died April 23.

FARRIS, ROBERT MCKNIGHT, Pittsburgh, Pa.; New York College of Dentistry, 1895; died May 3.

FLEETWOOD, CLINTON T., Seattle, Wash.; North Pacific College of Oregon, School of Dentistry, 1917; died May 1.

FORSYTHE, HARRY H., New York, N. Y.; National University College of Dentistry, Philippine Islands, 1894; died April 26; aged 71.

FRALICK, ROBERT G., Flint, Mich.; University of Michigan, College of Dental Surgery, 1907; died May 3; aged 60.

GLEASON, SUMNER, Abington, Pa.; died May 9; aged 83.

HAMIL, FREDERICK L., Lincoln, Ill.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1899; died April 29; aged 69.

HAMPTON, T. M., Helena, Mont.; Baltimore College of Dental Surgery, 1890; died recently; aged 79.

HILL, E. B., Salina, Kan.; Kansas City Dental College, 1906; died March 28; aged 62.

HOLLIHAN, JOHN H., Lawrence, Mass.; Baltimore College of Dental Surgery, 1909; died April 20; aged 57.

HOLT, LESTER C., Springfield, Mo.; St. Louis University School of Dentistry, 1910; died May 1; aged 55.

HUNTER, WILLIAM SCOTT, Reedsville, Pa.; Temple University School of Dentistry, 1903; died May 6; aged 63.

JOHNSON, AUGUST PETER, Omaha, Nebr.; Baltimore College of Dental Surgery, 1897; died April 18; aged 69.

KIBLER, WILLIAM L., Charlotte, N. C.; University of Maryland, School of Dentistry and the Baltimore College of Dental Surgery, 1913; died April 27; aged 52.

KNOFF, R. G., Bluffton, Ind.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1909; died May 13; aged 57.

KRAMER, WENDELL, Riverside, Calif.; died May 7.

KREIBOHM, WILLIAM L., Milwaukee, Wis.; died April 23; aged 65.

KRESGE, N. M., Columbus, Ohio; Cincinnati College of Dental Surgery, 1925; died May 9; aged 46.

LEAMON, ROY LESLIE, Mexia, Texas; Tulane University of Louisiana, College of Medicine, School of Dentistry, 1921; died March 13; aged 45.

MACKENZIE, NORMAN M., Redwood City, Calif.; College of Physicians and Surgeons of San Francisco, A School of Dentistry, 1917; died April 27.

MAIN, DAVID T., Buffalo, N. Y.; University of Buffalo, School of Dentistry, 1903; died April 20; aged 67.

MAJOR, J. A., Waterville, Wash.; Georgetown University, School of Dentistry, 1912; died April 26; aged 65.

MARKLEY, EDGAR H., Gettysburg, Pa.; University of Maryland, School of Dentistry and the Baltimore College of Dental Surgery, 1892; died April 22.

MAVIS, HOMER V., Wauwatosa, Wis.; Marquette University, School of Dentistry; died April 25; aged 37.

MEEKIN, JOSEPH A., Fredonia, N. Y.; University of Buffalo, School of Dentistry; died April 21.

MILLS, E. J., Dallas, Texas; died April 14; aged 79.

MITCHELL, W. W., Detroit, Mich.; Detroit College of Medicine, Department of Dental Surgery; died April 16; aged 69.

MOORE, LUTHER H., Appleton, Wis.; Western Dental College, 1895; died April 16; aged 75.

MOORHEAD, JAMES H., Brooklyn, N. Y.; New York College of Dentistry, 1923; died April 25; aged 45.

NOTEWARE, HOWARD MARTIN, Owego, N. Y.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1923; died April 18; aged 42.

PAYNE, JAMES F., Norfolk, Va.; School of Dentistry, Medical College of Virginia, 1911; died May 6; aged 66.

PIKE, EZRA A., Lynn, Mass.; Tufts College Dental School, 1904; died recently; aged 64.

PRESSLER, CHARLES J., Waverly, Ohio; Ohio Medical University, College of Dentistry, 1903; died May 14; aged 66.

RANDOLPH, ALBERT F., Jackson, Mich.; died May 9; aged 79.

REESE, ERNEST E., Indianapolis, Ind.; Indiana University School of Dentistry, 1888; died May 6; aged 83.

REICH, L. E., Kellogg, Idaho; died April 27; aged 62.

ROUNDS, RALPH J., Athens, Pa.; Temple University School of Dentistry, 1928; died April 29; aged 41.

SAPPER, BENJAMIN M., Pittsburgh, Pa.; died April 16; aged 62.

SCANLON, JOSEPH H., Pawtucket, R. I.; University of Maryland, School of Dentistry and the Baltimore College of Dental Surgery, 1913; died May 3; aged 54.

SCHMIDT, ROBERT R., Elmira, N. Y.; University of Buffalo, School of Dentistry, 1899; died May 7; aged 67.

SHOEMAKER, GEORGE G., Cumberland, Md.; Baltimore College of Dental Surgery, 1903; died May 14; aged 70.

SNYDER, RICHARD H., Chicago, Ill.; Northwestern University Dental School, 1924; died May 5; aged 41.

TANTON, CREEL A., Niagara Falls, Ontario; University of Toronto, Dental Department, 1923; died April 16; aged 46.

THOMPSON, GEORGE E., Seattle, Wash.; Temple University School of Dentistry, 1888; died April 29; aged 77.

WALCOTT, FRED, Troy, Mont.; died in March.

WELCHER, ALONZO F., Indianapolis, Ind.; University of Louisville, School of Dentistry, 1902; died May 13; aged 68.

WOLFE, HERBERT, Salem, Ky.; University of Louisville, School of Dentistry, 1905; died April 29; aged 73.

ZIEGLER, GEORGE O., Pacific Grove, Calif.; died April 1; aged 92.

CURRENT LITERATURE

Journal of Dental Research

February 1944

Titles marked with an asterisk are reviewed below.

*Comparative Studies on Lactobacilli Isolated from the Mouth and Intestine. R. W. Harrison and Zdenka Z. Opal, University of Chicago—1.

*The Effect of Vitamins on Acid Formation in Saliva. O. E. Fancher, J. C. Calandra and L. S. Fosdick, Northwestern University—23.

*The Effect of Synthetic Vitamin K and Related Compounds on the Rate of Acid Formation in Saliva. J. C. Calandra, O. E. Fancher, and L. S. Fosdick, Northwestern University—31.

*The Course of the Enamel Prisms Near the Cemento-Enamel Junction, Melvin Land, University of Rochester, and Bernard Gottlieb, Baylor University—39.

*The Epithelial Sheath: Its Functional Cycle; Part II. Moses Diamond and Edmund Applebaum, Columbia University—45.

*Some Observations on the Elimination of Yeast from the Mouth. Samuel S. Turesky and Basil G. Bibby, Tufts College—51.

*Factors Influencing Tests on the Abrasion of Dentin by Brushing with Dentifrices. Richard S. Manly, Procter and Gamble Company—59.

Studies on the Effect of Ingestion of Citrus Fruit upon Gingival Hemorrhage. Sterling V. Mead, Washington, D. C.—73.

Recording Tooth Movement with the Sectioned Oriented Cast

By Bercu Fischer

The position and inclination of the mandibular incisors are important factors in facial balance, anchorage preparation and the stability of the treated denture. Therefore, a method of recording and measuring these inclinations before, during and after treatment is needed. The method of construction and use of the sectioned oriented cast for this purpose is accurate and simple. The procedure is divided into (1) work on the patient, consisting of placing landmarks, adjustment of the dentiphore (which records them) and taking the impressions, and (2) the laboratory work. The work on the patient is for the purpose of relating the dentures to the Frankfort plane. This relationship is reproduced in the laboratory. One maxillary and two mandibular casts are made, with bases parallel to the Frankfort plane and reference planes perpendicular to this. One of the mandibular casts is sectioned anteroposteriorly through the left central incisor, parallel to the median plane. Selected points in the crown of the incisor are used to determine the incisor axis, and the angle of this axis to the Frankfort horizontal. This angle may then be transferred to a graph, for study and record. It is called the incisor-axial angle. The method is presented with the hope of offering a means of determining a normal incisor-axial angle. With the accumulation of data, it may be possible to find the answer to the question: At what angulation of the mandibular incisors does it become necessary to extract to assure the best results in orthodontic treatment?—*Angle Orthodontist*, 13:15-29, 1944.

Comparative Studies on Lactobacilli Isolated from the Mouth and Intestine

By R. W. Harrison and Zdenka Z. Opal

Saliva and stool specimens from twenty children and adolescents were cultured for lactobacilli. The frequency of isolation from the intestine was roughly proportional to the degree of caries activity and to the number of lactobacilli in the saliva. Repeated saliva samples from five caries-free children contained few or no lactobacilli and all the stool cultures from them were lactobacillus free. Lactobacilli were found in 93 per cent of the saliva samples and 68 per cent of the stool specimens from eleven patients with untreated carious lesions. Detailed data were obtained on approximately 100 cultures isolated from several successive paired specimens provided by sixteen persons on whom independent dental examinations were made before, during and after the period of bacteriologic study. All morphologic, fermen-

tative and immunologic types found in the intestine were also found in the mouth. Twenty-four paired cultures, oral and intestinal, from eight persons were found to be identical. It was concluded that all the cultures isolated from the intestine in this study were oral lactobacilli.

The Effect of Vitamins on Acid Formation in Saliva

BY OTIS E. FANCHER, JOSEPH C. CALANDRA AND LEONARD S. FOSDICK

THE effect of ingestion of vitamins on the rate of acid formation in saliva was determined by essentially the same chemical test as for caries susceptibility. Saliva from several persons was mixed and divided into several 10 cc. portions. The fresh saliva was analyzed for calcium, and to each of the other samples was added 1 gm. of glucose and 0.1 gm. of 300-mesh powdered human enamel. Appropriate amounts of test material were added to all but two of the samples, which were kept as controls. All of the samples were incubated for four hours at 37° C. and then analyzed for calcium. The difference in calcium content of the test samples and of the controls depends on the acids formed. The effects of ingestion of vitamins A_1, B_1, B_2, B_6, C, D, E and K, menadione, nicotinic acid, nicotinic amide, p-aminobenzoic acid, cholesterol and cerophyl were studied. The presence of most of these substances had no effect on acid production, but the ingestion of cholesterol, cerophyl, nicotinic acid and possibly thiamin caused a slight increase in acid production. Menadione acted to completely inhibit acid formation at a concentration of 1.3 mg. per hundred cubic centimeters of saliva, and ingestion of vitamin K was followed by a definite, but incomplete, inhibition. There was no indication that this action has any relationship to the vitamin K activity of these two substances.

The Effect of Synthetic Vitamin K and Related Compounds on the Rate of Acid Formation in Saliva

BY JOSEPH C. CALANDRA, OTIS E. FANCHER AND LEONARD S. FOSDICK

A NUMBER of compounds chemically or physically related to 2-methyl-1,4 naphthoquinone were tested for their action on the rate of acid formation in saliva: 1,4-benzoquinone, menadione, vitamin K, "menadione sodium bisulfite," "hykinone," "synkayvite," 2,3 dichloro-1,4-naphthoquinone, 2-methyl-1,4-naphthohydroquinone, 2-methyl-1,4-naphthohydroquinone diacetate, potassium 2-methyl-1,4-naphthohydroquinone-3-sulfonate, "styptavite," citrinin, l-cystine, alloxan, sodium malonate, ethyl malonate, sodium maleate, morpholine, p-aminophenylglycine, hydrogen peroxide, sodium carbonate peroxide, urea peroxide, magnesium peroxide and urethane. All of the quinone and hydroquinone derivatives were effective in inhibiting acid production. The dehydrogenase inhibitors were effective, but only at higher concentrations. Of the several peroxides tested, urea peroxide and sodium carbonate peroxide were quite effective even at low concentrations, but hydrogen peroxide and magnesium peroxide had little effect at the lower concentrations. The evidence indicated that there was no correlation between vitamin K activity and acid formation inhibition, but rather a relationship with the oxidizing or reducing action of the compounds.

The Course of the Enamel Prisms Near the Cemento-Enamel Junction

BY MELVIN LAND AND BERNHARD GOTTLIEB

ENAMEL prisms near the cemento-enamel junction, as seen in the stage of differentiation prior to maturation, assumed an occluso-angular position in ninety-five of 110 sections studied. Only thirty-seven of 124 ground sections of fully calcified enamel showed a similar situation of the prisms. The discrepancy appeared to be the result of change in the course of the prisms from occluso-angular to one at 90° to the long axis of the tooth, occurring during maturation. Eight decalcified and eight ground sections indicated rods arched toward the root apex. Prisms directed in various directions developed near the cemento-enamel junction in the same tooth.

The Epithelial Sheath: Its Functional Cycle. Part II

BY MOSES DIAMOND AND EDMUND APPLEBAUM

THE life cycle of the epithelial sheath

cannot be observed in any one stage of the development of the tooth. Its true histogenesis may be observed only at a time when the enamel matrix is still in the process of formation in the cervical regions. At a later stage in development, when the root dentin and cementum are in the process of formation, the organic connection between the epithelial sheath and the inner and outer layers of the enamel organ can no longer be seen. A false view regarding the histogenesis of the epithelial sheath may be readily obtained at this stage.

Some Observations on the Elimination of Yeast from the Mouth

By SAMUEL S. TÜRESKY AND BASIL G. BIBBY

TESTS on the elimination from the mouth of artificially introduced yeast indicate that, in descending order, chewing apples, sticky candy, chewing gum, paraffin and peach were more effective than toothbrushing in cleaning the mouth. Preliminary tests indicate that carrot and bread and butter greatly aided, but that prior use of mineral oil interfered with the cleaning mechanisms of the mouth. Intrinsic factors, possibly including the rate of salivary flow, seemed to be of greater importance in determining the rate of removal of yeast than the nature of the cleansing agents used on a toothbrush.

Factors Influencing Tests on the Abrasion of Dentin by Brushing with Dentifrices

By RICHARD S. MANLY

PROCEDURES were devised for testing the abrasiveness of dentifrices, making use of machines capable of brushing eight teeth simultaneously, and a shadowgraphic method for measuring cervical dentin wear. Other equipment was prepared in order to determine whether abrasion takes place on exposed dentin when it is brushed toward the occlusal surfaces. The brush itself was found to have insignificant abrasive power, since a dry brush abraded dentin only 1 per cent as much as the average of leading pastes and powders. The wet brush was less abrasive. It was found that dentifrices are rapidly diluted during toothbrushing, and a 33 per cent concentration of dentifrice is within the range of dilutions observed *in vivo*. When teeth with exposed cementum were brushed in a machine in a direction parallel to their long axis, wear of cementum and dentin was produced on most of the teeth, but the average rate of abrasion was less than that found with cross-brushing. When notched ivory cylinders were brushed with abrasive, little or no wear occurred on the crests of the surfaces brushed, and the maximum abrasion occurred in the deepest depressions. Decalcified dentin exhibited about the same resistance to wear by popular abrasive-containing dentifrices as did normal dentin. Although the resistance to wear by a moist brush was decreased, decalcified dentin was worn by the moist brush merely 7 per cent as much as by solid-containing dentifrices.

Pulp Reactions to Dental Cements

By E. B. MANLEY

CAVITIES were cut with a slow turning bur, as previously described, in sound premolar teeth of patients varying in age from 10 to 16 years. A number of control fillings of (1) cotton-wool impregnated with olive oil and (2) dry asbestos fiber were sealed into place. Zinc phosphate, copper phosphate and silicate cements were tested. Although the powders varied in composition, the liquids consisted mainly of orthophosphoric acid with certain modifiers which control heat production and setting time. A zinc oxide-eugenol filling was inserted in some cases. Twenty-four or forty-eight hours after insertion of the filling, the teeth were extracted and serial sections later were made.

The changes occurring in the pulp under a control cavity were confined to those cells of the odontoblastic layer the fibrils of which had been cut. The lateral processes or collars of the odontoblasts were broken and many cells, having lost their fibrils, were scattered and dragged away from the denture surface. No inflammatory changes appeared in the pulp tissue. Under cement fillings, degeneration and destruction of the odontoblasts, vacuole formation, hemorrhage and acute inflammatory reaction were observed in the pulp. Reactions under zinc phosphate cements appeared to be less intense than those resulting from either copper or silicate ce-

ments. The presence of zinc oxide-eugenol fillings even under very deep cavities caused changes confined to the odontoblasts.

In the light of histologic evidence, it is clear that when using dental cements in their present form, we must modify clinical procedure if the incidence of pulp involvement is to be prevented, especially in regard to the teeth of young subjects. The author suggests that extension of the cavity involving the opening up of new and healthy tubules after removal of the carious dentin be kept to a minimum and that a thin smear of thickly mixed zinc oxide and eugenol used as a sublining would be sufficient to prevent pulp irritation.—*D. Rec.*, 64:75-86, April 1944.

J. E. GILDA.

Nutritional Deficiencies and Dental Caries in Northern India

BY C. D. MARSHALL DAY

In the Kangra District of Northern India, a great percentage of the population suffer from severe malnutrition. The diets are deficient in calcium, phosphorus and the fat-soluble vitamins. A great percentage of the population have severe rickets and osteomalacia. A preliminary investigation of a small group of children with clinical rickets showed them to have the remarkably low caries incidence of only 1.4 cavities per child. A similar study of women suffering from osteomalacia associated with frequent pregnancies showed 36 per cent to be caries-free and an average of only 1.5 cavities per individual.

Further investigations on a large scale in 200 boys living under comparable living conditions showed only 313 cavities in 5,457 teeth, an average of 1.56 cavities, 83 per cent of which was first degree caries. No correlation was found between the degree of rickets and hypoplasia; the incidence of hypoplasia and dental caries, or the incidence of rickets and dental caries.

Although cases manifesting symptoms of vitamin A deficiency showed no increased caries activity, those cases giving a history of chronic sepis, tuberculosis or repeated attacks of fever showed comparatively high caries scores almost without exception. The incidence of dental plaques (98 per cent), salivary calculus (82 per cent) and gingivitis (81 per cent) was high, but was not related to the caries experience. The incidence of malocclusion was approximately half that noted in much more adequately nourished Indian children.

Although the diet is extremely low in fruits, vegetables, dairy products, meats and protective foods, it is high in natural unrefined foodstuffs such as cereals. There is almost a complete absence of sugar. The diet is notable for its detergent properties and its abrasive quality, which cause elimination of susceptible pits and fissures through attrition. The author concludes that the physical nature of foods and the maintenance of the traditional diet are of greater importance in preventing and controlling dental caries than the chemical and vitamin content.—*Brit. D. J.*, 76:115-122, 143-147, March 1944.

PAUL H. KEYES.

Age Changes and Variability in Gibbons

BY A. H. SCHULTZ

THE gibbon is the only one of the manlike apes which survives in vast numbers. Hence, it can be studied with statistically adequate material. For the present investigation, a sample of a wild gibbon population was available. Chiefly on the basis of this material, an analysis not only of the morphologic changes with advancing age and the range of individual variations and many metric and other features, but also of the composition of a typical group according to age and sex, as well as the frequency of developmental defects and the prevalence of pathologic conditions, has been made. Although many morphologic and pathologic findings are presented, only those relating to the dental apparatus are abstracted here.

In the gibbon, in lower catarrhines and in man, the deciduous teeth erupt in the following order: middle incisors, lateral incisors, first molars, canines and second molars. In all the great apes, this sequence differs inasmuch as the second molars appear before the canines. The permanent dentition of the gibbon has the following order of eruption: lower first molars, upper first molars, lower and upper middle incisors, lower lateral incisors, upper lateral incisors, lower second molars, upper second molars, lower and upper second premolars in rapid and irregular succession, lower

canines, upper canines, lower and upper third molars. This sequence agrees very closely with that characteristic of great apes, but it differs significantly from that found in recent man.

The deciduous incisors of gibbons occlude with overbite in about two-thirds of the cases and meet edge to edge in one-third of all specimens. Among adults, overbite is found in 41 per cent of the cases, edge-to-edge bite in 54 per cent and underbite in the remaining 5 per cent. Gibbons are exceptional among catarrhines by having very large permanent canines in both sexes. On the average, however, the canines of males are significantly larger.

Pathologic conditions in the teeth and bones become steadily more numerous with advance in age and exposure to the hazards of living. The deciduous dentition was found to be entirely free of pathologic changes. Carious cavities are absent in juveniles, but they exist in about 1 per cent of adults with, at most, moderate wear of the teeth, and in 9 per cent of the old animals. Alveolar abscesses appear in 1.7 per cent of juveniles, affect 7.5 per cent of adults and have developed in 38.5 per cent of the senile. In a total of 104 senile gibbons, fifty-five have a least one diseased tooth or alveolus. In many, the dental apparatus has become nearly useless on account of extreme attrition, numerous abscesses and loss of teeth.—*Am. J. Phys. Anthropol.*, 2 (new series):1-129, March 1944.

Surgical Correction of the Congenital Cleft Palate

By H. S. Vaughan

Plastic repair of the hard and soft palates should not be considered before the eighteenth month. Before operation, the child should be free from oral and respiratory infections. The operative aim is to restore normal action of the palate muscles. Displacement, scarring or other damage should be avoided. The von Langenbeck operation, consisting of the mesial displacement of the mucoperiosteum covering the palate, followed by midline suture of the hard and soft palate regions, accomplishes this. The borders of the cleft are each split, the incision producing a wide raw surface. Lateral incisions, beginning at the pterygomaxillary sulcus, pass through the mucoperiosteum to the bone, and are continued forward close to the teeth and beyond the anterior cleft margin. The mucoperiosteum is then elevated. This separation permits the flaps to be moved to the median line and united without tension at the junction of the hard and soft palate. An appreciable contraction of the elongated palate must be expected from muscular action, in addition to scar contraction.—*Surg. Clin. North America*, 24:370, April 1944.

S. J. Fanale.

Functional Anatomy of the Skull

By S. L. Ruskin

The skull's protective character is maintained at the expense of elasticity. Thus, volume changes cannot be readily accommodated by the external bony covering, and this inability to compensate for fluid volume changes is the basis for most cerebral pathosis. The weakness of anatomic structure determines the type of lesion that results from injury to a given region. The application of force to a certain point usually causes fracture or injury definitely associated with the structure of that area and surroundings. A fracture travels in a specific manner in accordance with function. The geometric structure of the skull, hydrostatic circulation factors and the development aid in the recognition and control of craniocerebral injuries.—*Ann. Otol., Rhin. & Laryng.*, 53:125, March 1944.

S. J. Fanale.

Behcet's Syndrome with Involvement of the Central Nervous System

By C. Berlin

Twelve cases have been reported which were characterized by recurrent attacks of aphthous-like lesions in the mouth and upon the genitalia. Ocular lesions also occurred as a hypopyon iritis. The disease runs a long chronic course with repeated attacks. The oral and genital lesions may heal, but repeated ocular lesions may result in serious visual damage. The pathogenesis remains obscure. Treatment with drugs, vitamins, etc., seems to result in little improvement, and the prognosis is poor. In nine cases, the removal of infected teeth and tonsils brought about temporary improvement. A

case is reported which presented classical signs for a five and one-half year period. The patient died after a severe cerebral attack. Necropsy revealed small multiple foci of inflammation and softening of the brain.—*Arch. Dermat. & Syph.*, 49:227-233, April 1944.

PAUL H. KEYES.

Trichlorethylene in Dental Anesthesia

BY JAMES H. BENNETT

A METHOD for using trichlorethylene to supplement nitrous-oxide-oxygen anesthesia in children is presented. Experience with 260 cases at the Cincinnati General Hospital seems to show satisfactory results. With a cooperative patient, usually less than three minutes elapsed between starting the anesthesia and beginning the extraction. Recovery is early, but patients may show some excitement. The incidence of nausea and vomiting was low in short cases, but higher when anesthesia was prolonged or when food had been eaten by the patient shortly before the operation. Eye signs had little significance, as in many cases eye movements accompanied satisfactory anesthesia. Purposeless movements of arm and legs frequently occurred during anesthesia, with no apparent significance. Premedication is helpful. Severe headache has been a complication in adult cases.—*South. M. J.*, 37:257-258, May 1944.

PAUL H. KEYES.

Osteomyelitis of the Jaws

BY ADOLPH BERGER

OSTEOMYELITIS of the jaws is predominantly of odontogenous origin. Relatively few cases are caused by metastasis from a remote focus of infection or by direct extension from an established focus in the soft tissues over the jaw. Clinically, there are three forms: (1) acute or fulminating with symptoms arising in the offending tooth with abscess formation, intense pain and raising of the mucoperiosteum; (2) subacute, and (3) chronic, in which the patient is comparatively comfortable with local and general symptoms either completely or almost completely subsided. Sequestration also occurs. Pathologic fracture of the affected jaw is a possible complication and may prevent bony union. Osteomyelitis following trauma is relatively frequent. Free drainage should be established first. Intraosseous pressure can usually be relieved by removal of the offending tooth. Drainage in the upper jaw usually can be adequately accomplished intra-orally. External drainage is often necessary in the lower jaw. The wound should be dressed every forty-eight hours during acute changes. Roentgenographic examination aids in diagnosis. Sequestrectomy should be performed only when the sequestrum is completely detached. —*Surg. Clin. North America*, 24:392, April 1944.

S. J. FANALE.

Exposure to Fluorides in Magnesium Founding

BY E. J. SARGENT AND I. F. FERNEAU

ANALYSES for fluorine were made of spot urine samples obtained from workmen exposed to industrial fluorine compounds in magnesium founding. The fluorine content of the samples showed that exposure occurs more in some foundry areas than in others. Although fluorine probably is being stored in the tissues in some cases, the rate of storage is believed to be relatively low. —*J. Indus. Hyg. & Toxicol.*, 26:113-116, April 1944.

PAUL H. KEYES.

A Specific Cutaneous Reaction in Persons Infected with the Virus of Herpes Simplex

BY F. P. O. NAGLER

THE primary infection with the virus of herpes simplex usually takes place in early childhood. The virus then remains latent, presumably in cells near the site of primary infection; i.e., in the buccal mucosa, lips or skin around the mouth. The typical vesicular lesions develop when the virus is activated by some other infection, exposure to excessive light, heat or cold, etc. Once infection occurs, it probably persists throughout life, and the patient may experience recurrent attacks. The virus is readily isolated from the vesicular fluid. All herpetically infected persons show a high level of neutralizing antibody in the blood, which can be demonstrated by chorioallantoic inoculation. A more simple cutaneous test has been developed, however, eliminating the necessity of securing and testing serum.

When a heat-inactivated preparation of herpes simplex virus is injected intracutaneously, a specific erythematous reaction is produced in herpetic persons. The reaction can be produced in both adults and young children and is regularly correlated with the presence of a circulating antibody against herpes virus.—*J. Immunol.*, 48:213-220, April 1944.

PAUL H. KEYES.

Skeletal Fixation in the Treatment of Fractures of the Mandible

BY D. B. PARKER

EXTRA-ORAL fixation of mandibular fractures is indicated especially where there is inadequate or complete lack of intra-oral anchorage for the usual appliances. Two basic principles are used to secure anchorage in the mandible: (1) the use of screws penetrating the bone and retaining their hold by the retentive power of their threads and (2) the use of smaller pins, as found in the Roger Anderson technic. The fixation appliance should enter the mandible body, whenever possible in the lower third of the vertical diameter to avoid the mandibular canal or the apices of any teeth that are in the area. When pins are to be placed in the ramus, a point near the angle or external oblique ridge should be selected if no third molar is present. The appliance should not be placed closer than 1 cm. from the fracture line margin. It is desired that the pin or screw penetrate through the entire cross-section of the bone without traumatizing the lingual tissues. A posteducation roentgenogram should always be taken as a check. The mandible should be immobilized as much as possible for the first few weeks, after which restricted motion, with a soft diet, may be allowed. Usually, the appliance can be removed after the fifth week.—*Surg. Clin. North America*, 24:381, April 1944.

S. J. FANALE.

ANNOUNCEMENTS

ANNOUNCEMENTS must be received by the fifth of the month in order to be published in the forthcoming issue of THE JOURNAL.

CALENDAR OF MEETINGS

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, Cleveland, Ohio, September 11-16.

AMERICAN DENTAL ASSISTANTS ASSOCIATION, Omaha, Nebr., October 9-11.

AMERICAN DENTAL ASSOCIATION, Omaha, Nebr., October 9-11.

AMERICAN DENTAL HYGIENISTS' ASSOCIATION, Omaha, Nebr., October 9-11.

AMERICAN DIETETIC ASSOCIATION, Chicago, Ill., October 25-27.

AMERICAN PUBLIC HEALTH ASSOCIATION, New York, N. Y., October 3-5.

DISTRICT OF COLUMBIA DENTAL SOCIETY, second Tuesday in each month, at the Medical Society Auditorium, Washington.

GREAT LAKES SOCIETY OF ORTHODONTISTS, Toledo, Ohio, October 23-24.

MONTREAL DENTAL CLUB ANNUAL FALL CLINIC, October 25-27.

NATIONAL BOARD OF DENTAL EXAMINERS, July 31-August 1.

NATIONAL DENTAL ASSOCIATION, Cleveland, Ohio, August 14-18.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA, Pittsburgh, October 17-19.

GREATER NEW YORK DENTAL MEETING, December 4-8.

NEW YORK SOCIETY OF ORTHODONTISTS, New York, November 13-14.

WOMEN'S DENTAL SOCIETY OF NEW YORK, New York, N. Y., September 20 and November 15.

STATE SOCIETIES

September

Southern California, at Los Angeles (19-21)

March 1945

Wisconsin (19-21)

STATE BOARDS OF DENTAL EXAMINERS

Alabama, at Birmingham, September 25. Farrar McCrummen, Woodward Bldg., Birmingham, Secretary.

Arizona, at Phoenix, October 9. R. K. Trueblood, 25 N. Second Ave., Glendale, Secretary.

Arkansas, at Little Rock, August 21-24. Clarence W. Koch, 717 Donaghey Bldg., Little Rock, Secretary.

Florida, at Jacksonville, September 18-21. A. W. Kellner, P. O. Box 155, Hollywood, Secretary.

Kentucky, at Louisville, September 12-15. W. F. Walz, 1114 First Nat'l Bank Bldg., Lexington 3, Secretary.

North Carolina, at Raleigh, September 25. Wilbert Jackson, Rich Bldg., Clinton, Secretary.

North Dakota, at Fargo, July 10-13. R. A. Andrews, Carrington, Secretary.

Ohio, at Cleveland, September 11-13, or Columbus, October 9-11 (practical examination for dental candidates); at Columbus, October 12-14 (theory examinations for dental and dental hygiene candidates); at Columbus, October 10 (practical examination for dental hygiene candidates). Earl D. Lowry, 79 E. State St., Columbus, Secretary.

Pennsylvania, at Philadelphia and Pittsburgh, September 25-30. Reuben E. V. Miller, 61 N. Third St., Easton, Secretary.

South Carolina, at Columbia, October 5-7. T. C. Sparks, 1508 Washington St., Columbus 23, Secretary.

Tennessee, at Memphis, September 12-16. Russell L. Moore, Dyersburg, Secretary.

Wisconsin, at Milwaukee, July 10-14. Stephen F. Donovan, Tomah, Secretary.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE American Association for the Advancement of Science will meet in Cleveland, Ohio, September 11-16. The Dental Subsection of the association will present a

symposium on dental caries and fluorine September 11.

PAUL C. KITCHIN, *Secretary*,
Subsection on Dentistry,
Ohio State University,
College of Dentistry.

AMERICAN DENTAL ASSISTANTS ASSOCIATION

THE Twentieth Annual Session of the American Dental Assistants Association will be held in Omaha, Nebr., October 9-11. For further information, address

AILEEN M. FERGUSON,
General Secretary,
709 Centre St.,
Jamaica Plain, Mass.

AMERICAN DENTAL ASSOCIATION

THE next annual meeting of the House of Delegates of the American Dental Association will be held in Omaha, Nebr., October 9-11.

HARRY B. PINNEY, *Secretary*,
222 East Superior St.,
Chicago 11, Ill.

AMERICAN DENTAL HYGIENISTS' ASSOCIATION

THE twentieth annual meeting of the House of Delegates and the Board of Trustees of the American Dental Hygienists' Association will be held in Omaha, Nebr., October 9-11. Headquarters will be at the Hotel Fontenelle.

A. REBEKAH FISK, *Secretary*,
1704 North Troy St.,
Arlington, Va.

AMERICAN DIETETIC ASSOCIATION

THE annual meeting of the American Dietetic Association will be held at the Palmer House, Chicago, Ill., October 25-27. The sessions will be devoted to discussion of plans and problems relating to food and nutrition in connection with the war. Topics will include progress of the acceleration program to increase the number of qualified dietitians; improvement in methods in teaching student nurses; recruitment of dietitians for the Army; administrative food problems; newer developments in diet therapy; maternal and child nutrition; school lunch problems; rationing and food supplies; labor policies in food service units, and technology of foods. There will also be discussions of postwar plans and the extent to which the association and its members can participate. Details of the program will be released as they develop.

AMERICAN PUBLIC HEALTH ASSOCIATION

THE Executive Board of the American Public Health Association announces the Second Wartime Public Health Conference and the seventy-third annual business meeting in New York, N. Y., October 3-5. Meetings of related organizations will take place October 2. Headquarters, Hotel Pennsylvania. The scientific program will be devoted to wartime emergency matters as they affect public health. The chairman of the Local Committee in Charge of Arrangements is Ernest L. Stebbins, M.D., health commissioner of New York City. The chairman of the program committee is Reginald M. Atwater, M.D.

WILLIMINA RAYNE WALSH,
Associate Secretary,
1730 Broadway,
New York 19, N. Y.

DISTRICT OF COLUMBIA DENTAL SOCIETY

THE District of Columbia Dental Society holds its meetings on the second Tuesday of every month, at the Medical Society Auditorium, 1718 M. St., N.W., Washington.

J. WALTER BERNHARD, *Secretary*,
1835 Eye St., N.W.,
Washington.

GREAT LAKES SOCIETY OF ORTHODONTISTS

THE next meeting of the Great Lakes Society of Orthodontists will be held October 23-24 at the Commodore Perry Hotel, Toledo, Ohio.

C. EDWARD MARTINEK, *Secretary*,
661 Fisher Bldg.,
Rochester, N. Y.

20th ANNIVERSARY—MONTREAL FALL CLINIC

THE program for the 20th anniversary meeting, which will be held on October 25, 26 and 27 is rapidly taking form, and at this point would appear to be well up to the standard set by previous meetings. Among the clinicians appearing on the program will be: R. O. Dingman, Ann Arbor, Mich, "Oral Surgery"; E. R. Granger, Mount Vernon, N. Y., "Oral Diagnosis"; R. D. Som-

mer, Ann Arbor, Mich., "Root Canal Therapy"; S. A. MacGregor, Toronto, Ontario, "Children's Dentistry."

It is anticipated that several clinicians and essayists from the Canadian Dental Corps will also participate in the program, through the kind courtesy of Brigadier F. M. Lott, Director General of Dental Service, further details of which will appear in the near future.

Table clinics, group clinics, educational films, and a large and diversified commercial exhibit will round out the program.

Any dentist, in good standing, who is not on the mailing list of the Montreal Dental Club, and who wishes to obtain further particulars on this meeting will kindly forward his name and address to the chairman.

M. L. DONIGAN,
1414 Drummond Street,
Montreal, Canada.

NATIONAL BOARD OF DENTAL EXAMINERS

THE National Board of Dental Examiners will hold its next two sessions for the examination of candidates in Parts 1 and 2, July 31-August 1 in schools where there are five or more candidates. For further information, address

GORDON L. TEALL, *Secretary*,
Box 71,
Hiawatha, Kan.

NATIONAL DENTAL ASSOCIATION

THE National Dental Association will hold its thirtieth annual session August 14-18 at the New Central High School, Cleveland, Ohio. For further information, address

J. A. JACKSON, *Secretary*,
Charlottesville, Va.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA

THE Odontological Society of Western Pennsylvania will hold its annual meeting at the William Penn Hotel, Pittsburgh, October 17-19.

W. EARLE CRAIG, *Secretary*,
Suite 206, Jenkins Bldg.,
Pittsburgh 22.

GREATER NEW YORK DENTAL MEETING

THE Greater New York Dental Meeting will be held at the Hotel Pennsylvania, New York, December 4-8.

WILLARD S. BELL, *Chairman*,
Press and Publication Committee,
Room 106A, Hotel Pennsylvania,
New York.

NEW YORK SOCIETY OF ORTHODONTISTS

THE next meeting of the New York Society of Orthodontists will be held at the Waldorf-Astoria Hotel, New York, November 13-14.

NORMAN L. HILLYER, *Secretary*,
Professional Bldg.,
Hempstead.

WOMEN'S DENTAL SOCIETY OF NEW YORK

THE next meeting of the Women's Dental Society of New York will be held September 20 at the Pennsylvania Hotel at 8 p.m. Carlton Frederichs will speak on "Victuals, Vitamins and Victory."

MATHILDE FREUND, *Chairman*,
Publicity Committee,
Scarsdale.

SOUTHERN CALIFORNIA STATE DENTAL ASSOCIATION

THE annual meeting of the Southern California State Dental Association will be held at the Biltmore Hotel, Los Angeles, September 19-21.

ROBERT L. BORLAND, *Secretary*,
1052 W. 6th St.,
Los Angeles 14.

WISCONSIN STATE DENTAL SOCIETY

THE 1945 meeting of the Wisconsin State Dental Society, the Diamond Jubilee, will be held March 19-21, 1945.

BOARD OF DENTAL EXAMINERS OF ALABAMA

THE Board of Dental Examiners of Alabama will conduct its next dental examination beginning September 25 at Birmingham. Credentials and fees must be in the hands of the secretary two weeks in advance of the examination. For application blanks and further information, address

FARRAR MCCRUMMEN, *Secretary*,
1005-1006 Woodward Bldg.,
Birmingham.

ARIZONA STATE DENTAL BOARD

THE next examinations to be conducted by the Arizona State Dental Board will be

held in Phoenix commencing October 9. All credentials must be in the office of the secretary by September 25. Address all communications to

R. K. TRUEBLOOD, *Secretary,*
25 N. Second Ave.,
Glendale.

ARKANSAS STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the Arkansas State Board of Dental Examiners will be held at the Hotel Marion, Little Rock, August 21-24. Applications must be filed with the secretary at least ten days prior to the meeting.

CLARENCE W. KOCH, *Secretary,*
717 Donaghey Bldg.,
Little Rock.

FLORIDA STATE BOARD OF DENTAL EXAMINERS

THE Florida State Board of Dental Examiners will hold its next examination of applicants for license to practice dentistry or dental hygiene in Florida at Jacksonville in the Seminole Hotel, September 18-21. Dental candidates must file preliminary applications by July 18. Final applications for dental and dental hygiene candidates must be complete by August 18. Address all communications to

A. W. KELLNER, *Secretary,*
P. O. Box 155,
Hollywood.

KENTUCKY STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the Kentucky State Board of Dental Examiners will be held September 12-15 at the University of Louisville Dental School, Louisville. Dentists graduated prior to 1944 must file applications, complete with full information requested, at this office not later than July 12. Applications of 1944 graduates must be in this office by August 12. Dental hygienists must have completed a two-year course and their applications must be filed before August 12. For application forms and further information, address

W. F. WALZ, *Secretary,*
1114 First Nat'l Bank Bldg.,
Lexington 3.

NORTH CAROLINA STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the North Carolina State Board of Dental Examiners for the examination of applicants for licensure will be held at the State Capitol, Raleigh, beginning September 25. Applications must be filed with the secretary thirty days before the examination. For application blanks and further information, address

WILBERT JACKSON, *Secretary,*
Rich Bldg.,
Clinton.

NORTH DAKOTA STATE BOARD OF DENTAL EXAMINERS

THE North Dakota State Board of Dental Examiners will hold its next examination at the Gardner Hotel, Fargo, July 10-13. Applications should be in the hands of the secretary ten days earlier. For further information and application, address

R. A. ANDREWS, *Secretary,*
Carrington.

OHIO STATE DENTAL BOARD

THE practical examination of the Ohio State Dental Board will be held at Western Reserve University School of Dentistry, Cleveland, September 11-13 and at Ohio State University College of Dentistry, Columbus, October 9-11. The practical examination may be taken either in Cleveland or in Columbus provided due notice is given to the secretary. The practical examination for dental hygiene candidates will be held October 10 at Ohio State University College of Dentistry, Columbus. The theory examination for both dental and dental hygiene applicants will be held in Columbus, October 12-14. All applications for these examinations must be in the hands of the secretary not later than September 28 and no application will be accepted after that date. For further information, apply to

EARL D. LOWRY, *Secretary,*
79 E. State St.,
Columbus.

DENTAL COUNCIL AND EXAMINING BOARD OF THE COMMONWEALTH OF PENNSYLVANIA

THE Dental Council and Examining Board of the Commonwealth of Pennsylvania will meet in Philadelphia and Pittsburgh September 25-30 to examine applicants for licensure to practice dentistry. For further information and application blanks, address the Department of Public Instruction, Bur-

eau of Professional Licensing, Dental Division, Harrisburg.

REUBEN E. V. MILLER, *Secretary,*
61 N. Third St.,
Easton.

SOUTH CAROLINA STATE BOARD OF DENTAL EXAMINERS

THE South Carolina State Board of Dental Examiners will hold its next meeting in Columbia, October 5-7. All applications must be filled out and returned to the secretary at least thirty days before the date on which the examinations are to begin.

T. C. SPARKS, *Secretary,*
1508 Washington St.,
Columbus 23.

TENNESSEE BOARD OF DENTAL EXAMINERS

THE Tennessee Board of Dental Examiners will hold its next examination September 12-16, at the University of Tennessee, College of Dentistry, Memphis, for licensure in dentistry or oral hygiene. Applications must be in the hands of the secretary at least thirty days before the date of the examination. For further information and applications, address

RUSSELL L. MOORE, *Secretary,*
Dyersburg.

VIRGINIA STATE BOARD OF DENTAL EXAMINERS

THE next regular meeting of the Virginia State Board of Dental Examiners will be held at the Medical College of Virginia, Richmond, beginning at 9 a. m., October 24, instead of September 19 as formerly announced. No applications will be accepted after October 7. Incomplete applications will be declined and returned. For application blanks and further information, apply to

JOHN M. HUGHES, *Secretary,*
715 Medical Arts Bldg.,
Richmond.

WISCONSIN STATE BOARD OF DENTAL EXAMINERS

THE Wisconsin State Board of Dental Examiners will hold its next examination July 10-14 at Marquette Dental School, Milwaukee, for licensure in dentistry or dental hygiene. For applications and other information, address

STEPHEN F. DONOVAN, *Secretary,*
Tomah.

ALPHA OMEGA

ALL Massachusetts members of Alpha Omega in service, both in this country and abroad, are requested to communicate with Abraham Gurvitz, War Service Committee, Alpha Omega Fraternity, 371 Commonwealth Ave., Boston 15, Mass.

SAMUEL S. HIRSON, *Secretary,*
Boston Alumni Chapter,
471 Commonwealth Ave.,
Boston, Mass.

RESIDENCIES IN DENTISTRY

THERE will be available July 1 two full-year residencies in dentistry at the Sea View Hospital, Staten Island, New York, N. Y., each with a stipend of $1,200 annually plus maintenance. Sea View Hospital, probably the largest tuberculosis hospital in the world, offers unusual facilities in the various phases of dentistry. Those interested should communicate with

RALPH HOWARD BRODSKY, *Director,*
Division of Oral Surgery,
14 East 81st St.,
New York 28, N. Y.

INTERNSHIP AND VOLUNTEER EXTERNSHIPS

THERE is an internship, as well as several volunteer externships, available for recent graduates in the Dental Department of the Bronx Hospital. Opportunity is offered for training and experience in oral surgery and exodontia, orthodontia, periodontia, endodontia (root-canal therapy) and operative dentistry. Application forms can be obtained by communicating with S. Berton Gerstner, Director, Dental Department, Bronx Hospital, Fulton Ave. at 169th St., Bronx 56, N. Y.

DENTAL INTERNSHIPS

Two internships are available at the St. Louis City Hospital for recent dental graduates. Opportunity is afforded for training and experience in dental and oral surgery, diagnosis and other phases of dentistry. Applicants should address Leo J. Wade, Medical Director, or Hamilton B. G. Robinson, D.D.S., City Hospital, 1515 Lafayette Ave., St. Louis, Mo.

DENTAL INTERNSHIPS

THE Greater New York Conference of Hospital Dental Services, comprised of a group of men who are chiefs of dental serv-

ices, would like to aid those men seeking dental internships in hospitals in the metropolitan area. Those who are not in the Army or the Navy and who are desirous of obtaining internships should communicate with

MARY E. REILLY, *Secretary,*
386 Fourth Ave.,
New York, N. Y.

DENTAL INTERNSHIP

AN internship is available to a recent dental graduate at the Research and Educational Hospital of the University of Illinois Medical Center. An unusual opportunity is afforded for training and experience in hospital dentistry and the medical aspects of dental disease. Application forms can be obtained from the Dean, University of Illinois College of Dentistry, 808 South Wood St., Chicago 12, Ill.

DENTAL EXTERNSHIPS

VOLUNTEER dental externships are available in the Research and Educational Hospital to dental practitioners desiring training and experience in hospital dentistry, dentistry for children and the dental aspects of systemic disease. Application forms can be obtained from the Dean, University of Illinois College of Dentistry, 808 South Wood St., Chicago 12, Ill.

CARNEGIE FELLOWSHIPS FOR RESEARCH AND GRADUATE WORK IN THE DENTAL SCIENCES

AIDED by the Carnegie Corporation of the New York and the Eastman Dental Clinic, the School of Medicine and Dentistry of the University of Rochester offers scholarships paying $1,200-$1,800 per annum to well-trained dental graduates who are interested in research or who desire special training in the basic medical sciences as an aid in dental teaching or practice. A few fellowships also offer part-time training in oral surgery. On appointment, the applicant is given the title of Fellow in Dentistry and, according to his interests, works as a graduate student in one of the departments of the medical schools. Here, excellent laboratory facilities, adequate direction and close contact with various investigations related to medicine and dentistry help his research and study. Fellows are encouraged to attend medical classes, seminars and staff meetings and, when opportunity presents itself, to participate in class instruction and scientific meetings. Contact with the problems of clinical dentistry may be maintained through the Oral Surgery Clinic of the Strong Memorial Hospital and the Rochester Dental Dispensary. With the approval of the Graduate Council of the university, Fellows may prepare themselves for the degree of M.S. or Ph.D. Applications should be made to

GEORGE H. WHIPPLE, *Dean,*
Rochester, N. Y.

FEDERAL POSITIONS FOR DENTAL HYGIENISTS

THE United States Civil Service Commission is continuing to recruit dental hygienists for federal positions. Experience is no longer necessary.

Completion of a full course leading to graduation from a recognized school of oral hygiene and registration as a dental or oral hygienist in a state, territory or the District of Columbia will qualify applicants.

Students enrolled in schools of oral hygiene may apply for federal positions when they are within nine months of completion of the course and may enter on duty on completion and registration. There are no age limits for the positions and no written tests. Appointees receive $1,970 a year entrance salary, which incorporates compensation for the eight hours of overtime included in the present forty-eight hour federal work week. The majority of positions are in Army hospitals and dispensaries throughout the country, particularly in the West and Southwest. Vacancies may occur also in the Veterans Administration and the Public Health Service. Applications should be filed with the Civil Service Commission, Washington 25, D. C.

W. C. HULL, *Executive Assistant,*
United States Civil Service Commission,
Washington, D. C.